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ABSTRACT

This publication summarizes the proceedings of the International Conference on Environmental Education which convened in Jerusalem, Israel, from August 18-21, 1975. Sponsored by The Hebrew University of Jerusalem and the Environmental Protection Service of Israel, this conference may be viewed as complementary to the previous two conferences on the quality of the environment held in the years 1971 and 1972. The present conference focused on the ways and means used in environmental education in Israel and abroad, mainly in the United States. The conference included five lectures, twenty-four workshops, and a symposium. The workshops were designed to enable teachers to experience activities, utilizing the variety of approaches which characterize environmental education, which could then be used in developing their own programs. Summaries and descriptions of the lectures, workshops, and field trips are presented. Since an extensive list of suggestions and ideas were offered by the participants, there was a need to establish an appropriate channel to examine the suggestions and ideas and accomplish those found to be worthwhile. Hence, it was decided to establish a sub-center for environmental education under the auspices of the Israel Science Teaching Center and the Environmental Protection Service of the Prime Minister's Office. (BT)

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Environmental Education

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INTERNATIONAL CONFERENCE on ENVIRONMENTAL EDUCATION

August 18 th to 21 st
Jerusalem

SE 020 494

The Amos De-Shalit
Science Teaching Center,
The Hebrew University of
Jerusalem

Environmental Protection
Service, The Prime
Minister Office

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INTRODUCTION

by

Yosef Burg

The society in the seventies and eighties is faced with two big challenges - a social one and an ecological one. Ecological issues often lead to a paradox. For example: industry, creates ecological hazards, but at the same time produces the means by which these hazards may be overcome. There are a few features which characterize the Israeli society, namely:

a) 92% of the land belongs to the government. As a result of this, regional and urban planning can be performed without too many disruptions.
b) The hasty development of industries since the establishment of the State resulted in the establishment of industrial plants all over the country with very little consideration of environmental issues.
c) Most of the population is concentrated in a few urban centres, such as the Tel Aviv area. This concentration creates severe problems of air pollution, water pollution etc.

In recent years considerable progress has been made in dealing with the quality of our environment, including the allocation of resort areas, nature reserves, restoration of the Kineret etc. Efforts have been made by the government to redistribute the population and direct people to areas such as the Gallilee. A Ministers Committee for Environmental Quality and an Environmental Protection Service have been established. Yet, perhaps the major vehicle to the preservation of our environment is <u>education</u>. Education in schools, at home and through youth movements should make special efforts to create a public which understands its responsibilities toward our environment and behaves accordingly. The fate of our environment is in our hands - let's not defeat ourselves!

ENVIRONMENTAL EDUCATION - SOURCES AND TRENDS

BY

P. Tamir

Introduction

In the last five years there is a growing concern of the public in environmental problems. At the same time the demand for environmental education is steadily growing. Studying the environment and environmental education should not be substituted for each other. The study of the environment deals with the whole complex of problems issues and aspects of the interrelationship between man and his environment including on the one hand "philosophical views about Man and his destiny and whether the environment as presently established directs Man to his destiny" and on the other hand such practical issues as waste disposal" (Ben David, 1972). The scientific literature, as well as the popular literature and the newspapers are full of studies and articles dealing with environmental quality and the dangers of its abuse to mankind. Public organisations, governments, municipalities, research and industrial institutions have given environmental problems a high priority. This high interest in the environment has reached Israel too, as evidenced by the two National Conferences on Environmental Quality held in Jerusalem in 1971 and 1972, as well as by the establishment of the Environmental Protection Service under the auspices of the Prime Minister Office. In the Second Conference a variety of studies were presented on topics such as pollution standards (air, water and food pollution) toxicology of dangerous gases (i.e. CO), health and medical implications of pollution, pesticides, urban planning, nature reserves, recreation zones etc. At the same time discussions and deliberations regarding priorities in treating environmental issues took place. (Reshumot, 1972). Although mentioned in that Conference, education was dealt with only as far as the training of environmental scientists and technicians was concerned. Such a training is, of course, the function of institutions of higher education. Almost all such institutions in Israel have already established environmental courses. Yet, as mentioned by Gunner (1972), they are faced with two questions:

"1. Can the future environmentalist be properly trained under traditional discipline courses?
2. Will the University be able and willing to abandon its all of academic stanze and actively participate in solving actual public and social problems?"

Indeed, a variety of available programs were presented at the Conference (Reshumot pp. 148-154). However, such programs do not represent what we mean by environmental education.

The study of the environment and the development of environmental sciences are of course very important for the protection of environmental quality. Yet, unless they are complemented by the education of the citizens to environmental literacy, the aim of protecting the quality of our environment will not be achieved.

Environmental education is a comprehensive, integrative education directed at every citizen rather than at a few specialists. The content of environmental education includes the total environment of man - the biological, social, economic, cultural, ethical and aesthetic components of the environment. It is aimed at producing an individual who is motivated toward the rational use of the environment in order to develop the highest quality of life for all.... It includes the basic understanding that man is not a separate form of life and completely independent, but that he is interrelated to resources both natural and cultural and to other forms of life around him... He should have an understanding of how to identify environmental problems, how to solve these problems and the acceptance of responsibility for the solution of the problems as a basic civic duty" (Rillo, 1974, p. 55).

The Needs and Sharing of Society

As already mentioned, environmental education meets a significant need of our society. Any citizen should be aware of the factors which may influence our environment, the dangers which may abuse the quality of the environment as well as the means to deal with environmental problems. The following outcomes are sought:

(a) A knowledgeable citizen may be expected to behave rationally, not to abuse the environment and try to protect its quality.

(b) When faced with decision making, he will be able to reach appropriate decisions based on rational considerations and decline political pressures often put on naive and uninformed public.

(c) While it is important to advocate environmental protection, often uninformed statements are made which unduely exaggerate the ill effect of technology, industry and modern civilisation. Statements of this kind may create unnecessary tension, even hysteria (Ben David, 1972) and may cause unconsiderate hasty "anti technological" responses with far reaching negative effects.

(d) Another aspect, different than those mentioned above, is the availability of services of various people in the community which are often ready to cooperate either in school, or out of school in educational activities which pertain to environmental quality.

The Needs and Interest of the Learner

Often a clash exists between the needs and interest of the individual student on the one hand, and those of the society, on the other hand. Many students study a lot of what is presented in schools, not because they like it, or because they feel that it is important for their development, but rather because this is what the school (namely the society) believes to be important. A major reason for a low level of motivation to learn is the inability of the students to see the relevance of their studies to their own good. Environmental topics appear to have a distinct advantage in this respect. The study of this topic should be based on the

environment of the student, on current problems which touch the student directly and therefore, naturally, interest him. The opportunity not to rely solely on learning from books, but rather involving the student in problem identification actual observations, data gathering and analysis as well as making inferences and drawing conclusions, will contribute significantly to the development of both skills and positive attitudes. An environmental study framework allows for more individualized approaches to meet the needs and interest of each student. The integrative nature of environemntal study has a special advantage for younger students who are often not able to distinguish among the disciplines and select those which may help them to solve problems which they identify in their surrounding. (See Blum, 1973, p. 31).

Integrated Curriculum

The advantages and potential of integrated curricula has recently received a wide treatment (UNESCO, 1973). Two different integrated approaches to environmental issues have been suggested: the first calls for special environmental programs which draw upon the traditional disciplines such as biology, chemistry etc. The second attempts to incorporate environmental aspects into each of the traditional disciplines wherever such an approach is adequate.

Brennan (1974) advocates the second approach. According to him, "programs narrowly conceived - space, special health, nature, conservation - have always failed or met with limited success. To be successful and enduring, programs must become integral part of general education.... Educator, curriculum specialists and teachers, rightly look with suspicion on any new claims on their time and the time of their children" (Brennan, 1974, p. 17). The research and development of materials to fit this approach are the aims of the newly established Pinchot Institute in Pennsylvania. Yet, the other approach does have its proponents. Specially designed integrative curricula with a strong

emphasis on environmental issues are SCISP (1971) in England, Agriculture as an Environmental Science (Blum, 1972), Chemistry in Modern Society (Novick, 1974) and The Man and His Environments (Ben Peretz et. al. 1974) in Israel. Thus it appears that in Israel the trend is toward the design of specific environmentally oriented modules which will be taught as special units subsituting traditional disciplines such as biology, chemistry and agriculture. In any event, both approaches advocate integrated science and hence benefit from those advantages which result from an integrated approach (Blum, 1973). In addition to these benefits, an integrated approach "helps the student to gain an understanding of the role and function of science in his everyday life and the world in which he lives" (D'Arbon, 1972).

Teacher Education

An integrated environmental program is based on an eclectic approach which requires special teacher education. The teacher cannot rely solely on his own descipline and should be trained to deal with novel problems to which he himself may not know the answer, and perhaps even will not be able to find an answer. In addition, the assumption made that environmental studies should deal with local problems makes it necessary for the teacher to design his own curriculum. Certainly, resource materials can and should be made available to him, but even then he has to know how to use these resources and adapt them to his local situation. Indeed, one of the major purposes of the Environmental Education Conference, reported in this book, was to run a variety of workshops where teachers would be able to experience activities which then could be used in developing their own environmental programs.

Environmental Education Conference - August 18 to 21, 1975

This Conference may be viewed as complementary to the previous two conferences on the quality of the environment held in the years 1971, 1972. The present Conference focused on ways and means used in environmental education in Israel and abroad, mainly in the U.S. More than 200 participants from various parts of the country were present. 80% of them were educators, the rest comprised architects, economists, scientists, lawyers and housewives. Of the educators, about half were biology teachers, a third teachers of other subjects such as history, math, bible, geography etc. The rest were inspectors, curriculum developers, university professors and youth instructors. About half of the participants stated that they came because they considered the topic to be both important and interesting. About a third expressed their will to be actively involved in the improvement of environmental quality protection.

The Conference included five lectures, twenty four workshops and a symposium.

The workshops appeared to be most successful and exemplified the richness of topics as well as the variety of approaches which characterize environmental education (field trips, films, lab exercises, discussions, simulation games etc.).

In this book summaries and descriptions of the lectures, field trips and workshops will be presented.

When asked to evaluate the Conference, about a third of the participants responded. While many of them found at least some of the lectures to be interesting and useful, the workshops received the highest ranking. Teachers may take this order of preference as a guideline for desirable emphases in their own courses. Of course, there were also critical comments and reservations, but the overall response has been highly positive. Many participants offered suggestions and ideas. These, together with similar ones

offered at the senior educators deliberation on August 21st are listed below (no special order is intended):

1. Prepare materials for illustrating simple illustrations comprehensible to students.
2. Provide information on ecological problems which may be introduced to the classroom.
3. Emphasize the scientific bases and evidence and deemphasize intuitive, emotional approaches, which lack scientific support.
4. Identify environmental aspects in each of the traditional disciplines and introduce greater variation into environmental education.
5. Use audiovisuals more intensively, especially in lectures.
6. Form close contacts between educators and other professionals interested in environmental issues.
7. Find ways and means by which teachers and students may actually influence what happens in their community.
8. Conduct inservice training and courses for teachers on environmental issues.
9. Form a network of centers all over the country which will serve as meeting places, provide information and materials and organise regional environmental activities.
10. Prepare self-instructional teacher training materials on environmental topics.
11. Prepare appropriate teacher training programs and special university courses to be taught in such an integrated approach as that expected of teachers in their schools.
12. Incorporate environmental aspects in present curricula at all levels from kindergarten to high school.
13. Encourage the development of ecologically oriented programs for elementary schools.
14. Find ways to integrate cognitive and affective objectives.
15. Test the feasibility and desirability of a spiral approach to environmental concepts and skills.
16. Put a special emphasis on teacher training outdoors, in the field.

17. Prepare resource materials for educators at all levels.
18. Try teaching environmental topics by team teaching.
19. Prepare ecological modules to become part of the high school biology curriculum.
20. Involve high school students in actual environmental activities at the community level.
21. Direct high school students interested in individual research projects to choose ecological topics.
22. Identify in each school landscape features to be protected and preserved by the students.
23. Train field schools instructors and help them to design progressive high quality programs.
24. Prepare for general elementary teachers in teachers colleges a special environmentally oriented program.
25. Prepare field trips which emphasize urban environmental issues.
26. Examine environmental programs developed abroad (such as Investigating Your Environment developed by the BSCS) and adapt them for use in Israel.
27. Involve parents in educational activities dealing with the environment.
28. Conduct public quizes or prize bearing races on environmental topics.
29. Use field schools (such as Sdeh Boker) for teacher training in environmental topics.
30. Hold an annual environmental education conference.

In order to examine the above suggestions and accomplish those found to be worthwhile, there is a need for an appropriate channel.

Hence, it was decided to establish a sub-center for environmental education under the auspices of the Israel Science Teaching Center and the Environmental Protection Service at the Prime Minister Office.

Miriam Ben Peretz of Haifa University was elected as the Head of this organization. She is also the chairman of a three-person steering committee. Dr. Uri Marinov, Head of the Environmental Protection Service and Dr. Abraham Blum of the Faculty of Agriculture at the Hebrew University will be the other two members. A Council headed by Prof. A. Poljakoff-Mayber will assist in directing the activities of this new organisation.

Let's wish the organisation success and hope that the teachers will take advantage of its projected services.

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Is Environmental Education a Bandwagon?

by
Frank X. Sutman

Temple University

Introduction

It seems appropriate at this Environmental Education Conference to examine in a cautious-scholarly way environmental education as it exists today, from the point of view of a professional educator. One way of doing this is to ask the question: Is environmental education just another fad, just another bandwagon? This presentation will attempt to examine this question, and in addition will look at the environmental education movement in the United States to determine if we can learn anything from the successes and failures of this movement. The presentation gives two crucial references that should be examined closely as professionals in Israel more into the expansion of their environmental education activities.

Bandwagoning

There is always danger when any "new" educational movement or idea gets underway for that movement to be carried to extremes: that is to be adopted and accepted as a cure-all for a segment of educational ills before its worth is proven. This blatant adoption acceptance of an educational cure-all is very often referred to, in the United States as bandwagoning. Or the movement is referred to as a bandwagon. The reason for the expression is because the movement or idea seldom, if ever, meets its expected objective of being a cure-all. And in most instances it damages the ongoing process of rational education. That is bandwagoning can actually lessen the probability of the state objective or objectives being met. I consider values clarification courses,

courses in humanistic education, open space education for psychologically damaged children, and performance based teacher education, as it is presently being practiced, examples of bandwagoning.

For instance it is now known, that in large cities in the United States, that the use of open space type education with psychologically damaged youngsters of elementary school age has caused a significant drop in reading level among these youngsters. Yet new schools are still being built with the idea of exposing all children to open space education in spite of this finding.

This example does not imply that all "new" movements are bandwagons and are useless. What this example shows is that "new" educational movements can become so when they are adopted too quickly in the name of serving as a messiah.

Bandwagoning occurs for a number of reasons. One such reason, in a capitalistic society, is profit. Corporations and individual charlatan type educators abuse new ideas for their own financial purposes. Again, as an example, there are professors commanding $300 per day in consulting fees to run workshops in values clarification. There is no evidence, that these workshops and the courses graving out of the workshops, do anything to improve judgement of children on moral issues. There is evidence that when values clarification courses are substituted for courses in language skills, which happens in some school districts, that the language skill ability of children drops.

A second reason for bandwagoning is an honest attempt, on the part of educators, to combat or to overcome the difficulty encountered by school districts and teacher training institutions in accepting, even trying, educational innovations. It is the major premise of this paper that educational innovations can be helpful in improving the quality of education if bandwagoning is not allowed to occur.

Looking at Environmental Education as an Innovation

Our Conference is dedicated to nourishing an innovative movement already seeded in Israel: namely that of bringing environmental education to the schools. The nourishment of this seed can be helped by examining some strengths and weaknesses of a few activities in environmental education occurring in the United States. This examination can help, and if not lost sight of it can prevent bandwagoning here in Israel.

At the Western Hemispheric International Conference on Environmental Education held in the World Health Organization building in Washington D.C., in October of 1970, Paul Brandwein in his keynote address indicated that his concerns for environmental education in the schools had been presented 30 years earlier in a similar conference sponsored by the Pinchot Conservation Foundation. Thirty years had passed without any significant change in commitment to environmental edcuation; even with prodding from groups like the Pinchot Foundation and the Conservation Foundation. We know that a number of professors who had been prepared in several environmental fields sat for 25 years in some of America's leading universities, while the academic community moved almost totally towards an emphasis in the so-called hard-non humanistic sciences.

Today this extreme emphasis is being balanced by an expanding commitment to the humanistic sciences, and these professors may not breathe again.

It is significant to note that the 1970 Conference was directed to develop awareness among educational leaders in the western hemisphere. And ministers of education from 17 countries did attend, in addition to representatives from the United States and Canada. An Associate Director of the U.S. Office of Educations Division of Technology and Environmental Education, who attended the 1970 Conference, recently said that the 1970 Conference was the first of the new series of meetings designed to bring to educators an awareness of the need to incorporate environmental issues into schools and teacher training curricula.

The first Environmental Education Conference in Israel is beyond the awareness level. The nature of the workshops at this Conference are an indication that you as teacher educators and as teachers are ready for action! This action, unlike during earlier movements in both countries, can occur at the teacher training level before it occurs in the schools. Too often, in the past, teacher training has lagged far behind the needs of the schools. This time teacher education can & must take the leadership role.

During the 30 years of inactivity in the U.S., referred to earlier, there were a few notable exceptions. We can learn a lesson from one of these exceptions. As early as 1947 the Legislature of the State of New Jersey appropriated funds to be used by the New Jersey State Teachers' Colleges to convert an unused Civilian Conservation Corpse camp at Stokes State Forest to a conservation school to be used in giving teachers experience in outdoor education activities. For over 20 years this facility

serviced the training needs of every teacher graduating from the State College System: as well as serving an outdoor education facility for school children of all ages. Could Israel establish one or more such training to serve the needs of teacher education?

Only since about 1969 has the environmental education movement in the schools, in its broadest sense taken an any status in the United States. And this movement was very nearly short lived. For a few years ago an attempt was made, during the Nixon Administration, to close down the activities of the Division of Technology and Environmental Education. The argument was proposed that environmental education activities could be handled more efficiently by the Environmental Protection Agency. Fortunately, for several reasons this did not happen; and the Division of Technology and Environmental Education functions today. This Division has supported financially a number of projects directly related to school level curricula. But, in my opinion, far too little support has been available directly for projects related to teacher education. Fortunately some materials developed for use by children, in schools, placed in the hands of creative teacher educators, are serving as effective instructional materials in teacher preparation. The process oriented activities presented by Patricia Sparks at this Conference in Israel are examples of such materials. In Israel should there be support, through the Environmental Protection Service for a curriculum project in environmental education, specifically designed for teacher education? Even more urgent should the Environmental Protection Service together with the Ministry of Education develop an Environmental Center to deal with all aspects of environmental education? I believe that the answer to both of these questions is a resounding yes! And the time for this action is now.

Innovation and Environmental Education

You very often hear the phrase educational innovation. What does it mean? Recently John Pincus defined innovation as any new policy, process or organizational change. This definition, in education, applies to a particular classroom, school building, or school district even if the change has been established in general. Following this definition environmental education in the United States can be considered an innovation. In the same article by Pincus, appearing in a recent issue of the Review of Educational Research, he also gives perhaps a more fruitful definition innovation. He states that innovation can be considered to be "improvement of the educational processes, educational outcomes or the economic efficiency of education. Following this definition environmental education in the United States has not been innovative. For there is no evidence that any one of these three objectives has or is being met. The reason for this is that environmental education is being taught like most traditional subjects. Even more unfortunate environmental education is being presented as factual topics in existing Biology and other courses. These new topics are being crowded into existing courses to be covered.

In Israel you have the opportunity to learn from our mistake; to use this second definition for innovation and to make certain that your environmental program is truly innovative. This can be accomplished through emphasis on problem solving and student involvement in this process.

Two yeare ago, I made reference in a seminar at the Hebrew University to a publication titled: The Universities and Environmental Quality. This was a report to the President of the United States emanating from the Office of Science and Technology of the Executive Office. I refer again to this most

useful report. It states that: "it is patently obvious, but bears repeating, that the problems and opportunities related to our environment in a growing and increasingly technological society are multidisciplinary..... Many of our most serious [environmental] problems have arisen because narrowly conceived technological improvements have failed to take account of side effects.... which inevitably accompany a widespread technological change in society".

The Report calls for problem-focused rather than discipline focused environmental education. The introductory paper Curriculum and Teaching In Environmental Education: A Process Orientation, prepared for this Conference by Sparks, Sutman and Schmuckler, indicates that the Environmental Education Act, passed by the U.S. Congress, itself calls for a problem orientation in environmental education. The related activities by Patricia Sparks, are examples of problem focused environmental education activities. The solutions to these problems cut across traditional discipline lines.

For the most part problem oriented teaching in environmental education is occurring in the United States mainly in programs that are financially supported by outside monies, such as through the Office Of Education and through State funds under title III of the Elementary and Secondary Education Act.

Very little local school effort has gone into problem oriented teaching about problem oriented issues. This is the major reason I propose that environmental education has not been innovative according to the second definition given by Pincus. Once again, in Israel there is opportunity to develop your environmental education curricula along the lines proposed in the two documents that have been referred to; and in doing so make

the curricula innovative.

Problem-focused environmental education is catching on slowly in the U.S.; perhaps too slowly. If our schools do not become cognizant for their inability to become innovative, as ably analyzed by Pincus, I fear that the environmental education movement in the United States is in jeopardy. We in the U.S. and you in Israel must examine his propositions very carefully and act accordingly.

Israel has already begun to learn from our mistakes; it must continue to do so. Innovation can occur through continued commitment of the Environmental Protection Service and the Ministry of Education. Bandwagoning can be prevented through continued commitment of the universities, teacher training colleges and the schools. I see a great future both for Israel and for environmental education in Israel.

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SUMMARY AND RECOMMENDATION OF THE INTERNATIONAL ENVIRONMENTAL CONFERENCE

by

Frank X. Sutman

This summary and recommendations are for specific action in the area of environmental education for Israel.

In Israel there is a need, at this time, for greater emphasis in education about the conservation of the environment. This is true because it would serve to balance the present over emphasis on the more theoretical subjects taught in the schools, allowing for concern for humanistic problems and their solution. This Conference has indicated that the need should be met by instituting an Environmental Education Center where capable people from many disciplines would, on a part time basis, communicate and work together on a variety of activities related to environmental education. These would include, for example, development of curriculum materials, evaluation of materials and evaluation of different approaches to teaching about the environemtn, development of special materials for citizen or adult education, and serving as a nucleus to tie the environmental activities going on around the country together. The Center must deal with problems of educating Israeli people at all levels; even at the university level.

The center should be sponsored and supported by both the Environmental Protection Service and the Ministry of Education, obtaining additional support from other agencies. The center would make recommendations to the Environmental Protection Service and the Ministry of Education regarding environmental education matters. The center should be directed by a proven scholar who has oriented his or her attention to the more humanistic aspects of education. Staff members should include knowledgeable university level, school level and personnel from other levels on a part time basis; even on a temporary basis. The Director should have a part time committment to the

center, at least at the beginning.

A major commitment and responsibility of the center must be to serve all teacher training institutions in the country. This would be done, in part, by developing one or more environmental education "camps " to be used to give all teachers in training experience with outdoor environmental education problem oriented type experiences. These camps should be away from the college-university atmosphere; away from the traditional classroom.

The environmental education center staff would organize internships, training workshops, etc. for teachers and for other leaders in the country.

Initially, curriculum materials developed through the center should follow guidelines developed by an appropriate diverse committee. This committee should seriously consider the following ideas as they develop their guidelins:

1. the role of ecology as a motivational introduction to environmental education problems.
2. activities that are problem oriented and allow the teacher to serve more as manager and less as lecturer.
3. the adaptation of already available appropriate materials.
4. the incorporation of environmental concerns into traditional curricula when these materials are being revised.
5. the development of less specialized interdisciplinary type materials for use in the schools.

To cause this movement to go forward, Dr. Uri Marinov, Director of the EPS and the Minister should meet with other appropriate people, in the near future, to consider questions of finance, time schedules, etc. One year from now (by September 1, 1976) the leadership of this present Conference should be called together by a member of the Science Teaching Centre to

consider progress made, and to make further recommendations for action related to Israel's environmental education movement.

Several additional concerns were made following acceptance of the above recommendation-summary.

1. the center must consider preparing people to teach in the environmental field schools or camps.
2. the training of teachers needs consideration
3. an Urban Studies Center should serve at least as one of the field schools.
4. descriptive materials regarding the best places in industry to show examples of problems and solution of problems are needed.
5. contact with the British Council should be made for ideas as the Center develops.
6. publication of resource materials regarding environmental issues.

SUCCESSES AND FAILURES IN NATURE AND ENVIRONMENTAL QUALITY EDUCATION
(The ways of the society for the protection of nature)

by
Azaria Alon

Initially, before the nature preservation authority was established, the society for the protection of nature was largely occupied with the physical act of nature preservation, declarations of preservation, etc. After the authority was established, the society diverted its principal activity to the subject of education. Until recently the society was occupied with the protection of nature in its narrowest sense - protect landscape and nature treasures. A number of years ago, when the problems of the polluation of the sea of Galilee, and power plants along the coastline, and so on arose, the society broadened the scope of its action to that of environmental quality in general. From there it was not far to the specific subject of cleanliness maintenance education.

The society functions by means of two networks: Its urban branches, and field schools. The latter meet with a larger and more varied public, principally adolescents. At the present time the field schools handle50,000 youths per annum. Besides that, there is a central explanation network, mainly through the society newspapers. 20,000 copies of the veteran newspaper "Tevah Va'aretz", which is intended for adults, are distributed. "Sla'it", a newspaper for youths that has been started three years ago, has 19,000 subscribers, and "Pashosh", the youngest, a childrens' newspaper which now completed it's first year, reaches 14,000.

We were able to learn from the relatively successful action to prevent the picking of protected wild flowers. This was apparently a most unpopular thing; A strike against unaccepted and believed tradition. Together with

the nature preservation authority, the society went on an all encompassing, multifaceted campaign: included were - a law prohibiting picking flowers, distribution of information about the meaning of protected flowers, an explanation of the need for their preservation, and area supervision. What characterized this campaign was its consistency and perseverence through the years, while addressing itself to each age in accordance with its concepts. Use of law and fines was small, but deterent. Principally it was an educational campaign, and as such involved children. They turned into the major proponents of wild flower protection. After ten years of consistent educational action, it is possible to point out results in two areas: One is the strengthening of public awareness in general, and among children in particular; the second is significant improvement in the condition of wild flowers which, in the past, were placed in danger of extinction.

In another area where we tried a similar action, the prevention of harm to corals and to the rest of the underwater creatures, it is impossible to point to a similar success. While picking wild flowers affects a broader public, especially children, the majority of those who remove corals are adults, a portion of whom even do so for a living (illegally). Turning to logic and to the conscience did not work here, except in the smallest measure.

On the strength of our experience with the subject of wild flowers, about two years ago we embarked on an all encompassing action of environmental cleanliness education. We are still groping - whether for ways of explenation and action, or whether in preparation for an active crew. In reality, this task appears almost as physical labor: the adult public, whether individuals or as a whole, pollutes its environment without due consideration, and it is not easy to educate children to cleanliness in the midst of general growing pollution. The time we have spent on this, still does not enable us to reach

conclusions. Our fundamental approach is as follows: we will educate against pollution, whether by means of explanation, or by means of cleaning actions, which will be carried out by the children. The supposition is that children who take part in these actions, and especially if they are permanent actions, in a defined area (neighbourhood, school district, etc.) will be restrained in the future from polluting their environment, and the maintenance of cleanliness will come a second nature to them.

On the agenda: creation of extension networks that teachers and kindergarten teachers will use in environmental quality education.

ISSUES IN ENVIRONMENTAL EDUCATION

by

Avraham Blum

Introduction

Environmental education is more than the study of the bio-physical and human factors in our environment, as education is always more than the imparting of a subject matter field. Yet its backbone is the objective study of a variety of environmental facets. Therefore we shall first look at the structure of the envionrmental disciplines and their implications to education. We shall see that some demands often made in education are emphasized in environmental education. Then central issues will be discussed, as well as strategies, which will help us, hopefully, to foster environmental eudcation both within and outside the formal framework of schools.

The Structure of the Disciplines and Environmental Science

The environmental sciences include many and different disciplines, far more than is attributed commonly to ecology. When we speak about environmental sciences, we are not only referring to the entirety of the disciplines brought under one common heading. Important are the relationships between the different subject matter fields, between different aspects and, often, between different outlooks and different interests. On the same token environmental studies cannot consist of an array of chapters borrowed from various disciplines. Environmental units have to be integrated in one way or another (Blum, 1973).

Beyond the classical sciences (Comte, 1877), environmental science will draw mainly upon those disciplines, which Aristotle called practical, meaning those disciplines the aim of which is to do, to chose deliberately between given alternatives, to decide on an appropriate action, (Schwab, 1964).

Aristotle included in the practical disciplines mainly ethics and politics. We could add modern applied sciences like administration, systems theory and perhaps those parts of medical, engineering and agricultural sciences which are concerned with what should be done in a certain situation. Kotarbinski speaks about praxiology, "the science of efficient action":

> "... The tasks of praxiology are to formulate and to prove recommendations concerning what must be done: What it is advisable to do under definite circumstances in order to attain the intended results in the most efficient way". (Kotarbinski, 1962, p. 211).

Brandwein suggests a curriculum in ekistics, using a term renewed by Doxiades, meaning "the study of the ecology of human beings in settlements or communities". (California, 1971). Whatever the fancy word for it may be - environmental science embraces a range of disciplines which have a common aim: to show how the natural and man-made environment can be improved. We shall later come back to the question, if this integrated approach also means necessarily that a new school subject has to be created.

Environmental Studies and Environmental Education

When we consider environmental studies to be practical disciplines, they are only means to an end. In environmental education we aim at higher goals. We hope to impart values and to prepare students for action. This two-fold endeavour in both the cognitive and the affective domains is expressed in the definition adopted by the International Union for Conservation of Nature and Natural Resources:

> "Environmental education is the progress of recognising values and calrifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelationships between man, his culture and his bio-physical surroundings". (National Association for Environmental Education, 1972).

This definition recognizes two levels of understanding - that of basic concepts, which will be used in the development of the mental skills

needed in order to understand - on the second level - complicated inter-relationships, which are typical for the web of life.

Parallel to this there are two levels of affective learning: that of receiving particular values, a stage which begins when the students become aware of these values, and the higher level of internalising the values to some degree of commitment.(1)

The final goal of environmental education is reached when the student functions according to his best knowledge and reasoning, based on a commitment to improve as much as possible the quality of his environment. Such reasoning demands an understanding of environmental problems, knowledge how to procure up-to-date knowledge and skills to differentiate between facts, commentaries and propaganda.

So far we are still in need for appropriate curricular materials, which serve the goals that were defined above.

A monodisciplinary approach cannot serve our purposes, although we should examine each discipline taught in the school as to how it can contribute toward the understanding of environmental problems and their solutions. In order to foster the understanding of problems, the instructional activities should be organized around environmental problems like air pollution, pesticide residues, improving the landscape.

It should be stressed that in environmental education we are not only concerned with pollution problems but also with the creation of a pleasant environment. If we extend the domain of environmental quality to that of quality of life, then we shall have to prepare also curricula on fundamental problems like the race between population growth and food production, the

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(1) Cp. the classification of education goals in the affective domain in Krathwohl, Bloom and Masia (1964).

inequalities in society and possible remedies.

Controversal Issues in Environmental Education Curricula

Common to all these issues is their controversial character. Points at issue in each problem are the degree of immediacy, in which it should be dealt with, its possible causes and, even more so, the optimal remedies proposed. Common to these problems is also the emotional involvement, which they induce and which enter the deliberations. When reading statements about controversial issues we should try and analyse, which open, hidden or unconcious motives might have influenced a certain stand taken. One way how this could be done in a curriculum unit will be demonstrated in the following examples.

"Is the catastrophy imminent?" This is one of the questions, on which experts on the world hunger problem disagree. The question is also asked in the booklet "Fight Against Hunger" (Curriculum Center, 1975). Students read contrasting opinions of experts in development. Views of optimists clash with those of pessimists. The students on their part try to understand what stands behind the different opinions: belief, involvement in an ongoing project, temperament, experience etc.

Too easily a scape-goat is chosen, in order to simplify the problem. Such a goat can be a cow - as in the case of the holy cow in India. Did she create the hunger problem? Is she a by-product of ignorance? What is the ecological role which she fulfills? Can holy cows be slaughtered everywhere? These too are questions, on which students debate, with the help of task cards and reading chapters, which are part of the Fight Against Hunger curriculum. The questions are asked in the instructional materials, where also different views are exposed - but students are encouraged to come to their own stand.

One of the big dangers in environmental education is that blind involvement, which springs from good will, but which deviates easily towards

exaggerations and confusing facts with slogans. Environmental problems can be solved only when the facts are given an objective consideration. This is another skill, which we should develop in environmental education, for instance by presenting the students with excerpts in favour and against a certain way of thought or action. They could be asked to analyze (sometimes with the help of critical questions) how the authors stress what is convenient to their line of thought and feeling, sometimes by distorting the facts and taking them out of context and by using the classical tricks of propaganda (Doob, 1950). As example for a "classical" discussion, in which the opponents do not restrict themselves to an objective exposition of their views, can serve us Rachel Carson's very influential "Silent Spring", and the answer given to her arguments by the spokesmen of the US Department of Agriculture before a congressional committee. In the curriculum unit "The Fly, DDT and We" (Blum, 1974), for instance, these clashing expositions from both sides of the barricade appear under the heading "Who exaggerates"? and students are lead to distinguish between facts and emotional statements and to analyze how both sides explain the same facts, how they answer weak points in the opponent's arguments, but refrain from giving an answer, when this would be embarrassing.

The Problem how to Bring Information Up-To-Date

In environmental education there is a constant need to up-date information. This truism holds indeed for all domains of knowledge, but it has a special meaning when applied to the education towards problems analysis and problem solving. Real problems are influenced by many factors, the weighing of which changes all the time. The building of a new factory can deteriorate air quality in its vicinity very drastically. The introduction of an anti-pollution device can improve it. Data like the number of cars per hour, traveling through a village or recommendations for the use of pesticides change quickly and one has to know at least, where up-to-date information can be obtained. This could be a good opportunity for students to "learn how to learn" (a hackneyed educational platitude, which is still without cover in most of our schools, even those which have a library or are close to one). A strategy, how to teach students gradually to use books and periodicals, can be found in the teacher's

guide to the mentioned Fight Against Hunger unit. It is based on three degrees of guidance:

1. Students receive a list of books and periodicals, which are in the library, with full bibliographic details on the pages, on which they will find what they are looking for.

2. They obtain a list of recommended publications without further details. So they are obliged to use the table of content and the subject matter index. In a parallel unit, taught in the language arts, examples how to go about are given for the different school subjects outside language.

3. In the most advanced phase students are asked to find for themselves relevant chapters in books, articles in periodicals, with the help of a catalogue and abstracts.

The Need for Regional Activities

In environmental education we are concerned, i.a. with world wide issues and with changes in the whole biosphere. But a meaningful environmental education must begin at home, around the school and in the near vicinity of the student. For him a local ecological nuisance is more relevant than the account of a terrible disaster somewhere else. (This should not imply that typical case histories from further away cannot be used effectively where appropriate). In his close environment the student can stroll, learn from nature, collect impressions and observe data - all this without expenditures for travel. Therefore in environmental education, more than in any other educational field, regional activities are apt to tie the students mind and soul to his environment and its problems. Teacher's colleges, schools which encourage pedagogical innovations, pedagogical centers and clubs can contribute to this effort andprepare local materials, in which the specifics will be stressed, which students will be able to observe and experience in their own habitat.

Systems Analysis and Decision Making

In environmental education we do not confine ourselves to the description of the state of affairs and even not to the study of those theories, which teach us how to improve the environment, in which we live. In environmental education we have to learn how to examine practical suggestions on their merits and how to make an optimal decision in a complex situation - and in reality it is always complex.

In this task two auxiliary disciplines can help us: systems analysis and decision making. We approach the cybernetic era, in which we shall have to master powerful integrated systems, if we do not want to let them dominate us. Our habitats and the biosphere are systems too. When we come to analyze the manifold factors which interact in these systems, we need appropriate tools. Systems analysis and flow diagrams can be such instruments. They belong to a language which should not be restricted to the use of technologists. So far these topics were seldom taught in school, and we shall have to explore ways of fitting them into the curriculum.

In environmental education we are eager for action to improve the quality of life. Many outlooks, opinions and plans clash with each other and we have to choose among them. Here we have the problem how to decide, how to choose among alternatives, without being able to foresee all the possible implications, and while part of the factors like "enjoyment" or "peaceful environment" cannot be measured, since they belong into the realm of aesthetics and ethics. Decision making is a skill, which might be helpful, but is seldom developed in schools. Foecke (1971) argues that "... indeed, because the ordinary man in the street applies knowledge... much more often than he generates it, it would seem that the decision making method should receive as much attention as the scientific method". The number of alternatives, which we held in memory concurrently, is small, Simon (1974) estimates this number to be five, Shulman (1974) believes this number to be already on the high side, which only few people attain, and Schwab (1974) holds that most people can work with only two or three simultaneous hypotheses. Both Shulman

and Schwab agree that computers should be used in a very sophisticated way and that this can be done only after the alternatives were prepared carefully and the relevant data have been collected.

This does not suggest in any way that the computer can take the place of the human decision maker. It can only serve him and help him. This point should be stressed specially when we talk about environmental issues, in which we attribute to aesthetic and moral factors different weights, according to the decision maker's judgement. With this limitation in mind the complexity of the cybernetic era and the immediacy of the environmental problems force us to find less intuitive ways and to set aside time to develop skills needed in decision making.

Where in the over-crowded time table of our schools should this be done? Schwab (ibid) in summing up his paper on "Decision and Choice - the Coming Duty of Science Teaching" proposes:

> "... that the natural sciences, the social studies and the humanities in every school give serious thought to curtailing their time and coverage of their own subject-matters by one-third; that the time thus made accessible, be used to convey the disciplines of treatment of practical problems."

The declaration of the IUCNNR, which was cited at the beginning of this paper (National Association, 1971), goes on:

> "... Environmental education also entails practice in decision making and formulation of a code of behaviour about issues concerning environmental quality".

Various curricula in the social and natural sciences began already to produce units, the aim of which is to develop in students skills needed in decision making. Simulation games can be very suitable for that purpose

(Varenhorst, 1968). The science program of the Education Research Council in the US and the Schools Council Integrated Science Project (1973) in Britain were among the first developers of simulation games about environmental issues.

In other curriculum units, as "On Moulds and Mildew" of the Agriculture as Environmental Science Project in Israel (Blum, 1974), protocols of a meeting of decision makers are given to students, who have to take a stand and declare what decision they would have made. Students are also presented with controversial opinions of experts on insecticide pollution and are asked to evaluate their arguments critically. (Ibid).

The Foundational Approach to Science Teaching project in Hawaii prepared a special unit on decision theory. In new environmental education curricula like "People and Resources" of the Conservation Education Project in England (Barker, 1975) much room is allocated to the investigation of pollution problems in the students' vicinity and the search for possible solutions is encouraged.

The Need for an Involved Teacher

Above all environmental education is value education. The information conveyed to the students has to give the necessary factual background and to enable them to put the theory into action. Most important is the teacher's concern for, and involvement in, environmental problems. If he can persuade his students of his own sincerity in environmental issues and if he is involved in the struggle to improve the situation, his teaching and belief have a chance to be transmitted to his students. If he does not identify himself with what he is preaching, he will build up unintentionally his students cynicism towards environmental problems.

The ubfortunate experience with "Jewish conciousness" can show us how impossible it is to hand down a decision to educate from today on towards these or other important values, if the teachers themselves did not internalize these values and outside school there is no favourable atmosphere which could support the effort made. There are also other cases, in which the value education was confined to a certain hour in the school's time-table - and the results were in accordance with this approach. Education towards productivity and the values of creative

work became a monopoly of agricultural and industrial arts teachers, education to love one's homeland was "apportioned" to geography or the Education Hour of the classroom teacher (if it was not pushed out from there too for pressing "organisational reasons"). We have to remember this experience when we come to the question, if a new subject, Environmental Studies, should be introduced into the syllabus or not.

To Introduce a Spacial Subject or to Infiltrate into the Existing?

We discussed already the point that the environmental sciences do not constitute a separate discipline and that environmental studies cut across most subject matter fields. This does not imply that we should necessarily refrain from introducing a new subject into school. In Environmental Studies we can concentrate on the exposition of different, environmental issues, on their analysis in an interdisciplinary approach, on the crytallisation of a balanced, but integrated suggestion how to solve the problems, and on the education towards positive action. Yet, some very good reasons speak against putting all our trust into one school subject.

The point was made that by compressing environmental education into the school subject, we might push it into a solitary corner. Environmental Studies as a separate subject do not stand many chances of becoming a compulsory Bagrut (matriculation) subject, and therefore it will have difficulties in finding living space in high school - although even as elective Bagrut subject it would gain prestige. It would be difficult to find room in the heavy loaded weekly schedule for a new subject. In place of what should it come?

The problem is specially difficult in senior high school. In the academic streams the Bagrut examinations and the demands of the universities do not leave many degrees of freedom. In vocational high schools technical aspects are emphasized. There efficient production is considered the central goal and the commitment to environmental quality is not very outspoken. Barely

is there a commitment towards safety education. So far little attention was given, in vocational and industrial schools, to those environmental problems, which are created by industry and the accelerated use of energy from fossile sources.

The situation is better in elementary schools. Here the distance from Bagrut is greater, and the balance between knowledge acquisition and fostering educational values not so distorted. An important step forward on a promising road was made lately by the Pedagogical Secretariat of the Ministry of Education and Culture, when it decided to change the subject Agriculture, in elementary schools, into Environmental Studies and Agriculture. This decision was influenced mainly by two developments.

The new curricula in Agriculture as Environmental Science, which were developed during the last decade for grades 7-9 and which were already introduced into a large percentage of the schools, stress the environmental, non-vocational relevance of growing plants and animals. (Blum, 1971). Both the creative enjoyment, which can be gained from caring for living organisms and specially flowers, and the problems arising from the farmer's interference with nature are emphasized.

The second development, which contributed to the decision to change something in the composition of subjects in elementary schools, has to do with the inclination of many teachers to confine natural studies to the laboratory or the classroom. Here "Agriculture" was able to compensate partly for what was lost. How far the change of the name of the subject, from Agriculture to Environmental Studies and Agriculture will bring about also a further change in content and approach will depend mainly on public opinion and the teachers. Those biology teachers who neglected the education towards appreciation of the living environment and the care for plants and animals, did so because of their lack of knowledge and self-assurance and not out of any Weltanschauung. Agricultural teachers, whose scientific education was limited and whose training was one-sided, functioned in the opposite way and for the same reason: They felt secure in the garden and felt uneasy when confronted with theoretical questions in the basic sciences. This feeling of insecurity which was triggered

mainly because of lacking knowledge, is apt to hinder also in future changes in the direction of a stronger ecological-environmental emphasis. Therefore teacher pre- and in-service training in the new curricula and in what is behind them might be the key to an improved environmental education.

The introduction of a new subject, Environmental Studies, which will comprise elements from the natural sciences, "homeland" and social studies and which will stress the value aspect, could well increase the difficulties which exist already now in finding suitable teachers. Without an enormous effort in teacher training and re-training, much more than is done today, integrated curricula, which are necessary in Environmental Studies, will not be implemented. We shall have to find ways in teacher training, how to enlarge the study of science which is needed to understand facts and problems and, simultaneously, strengthen also the humanistic side, without which environmental education will not succeed.

Even when we assume that a place can be found for Environmental Studies in the weekly schedule and competent teachers can be trained, we still should try to infiltrate most other school subjects systematically with environmental consciousness. We can take as an example the approach of the Bavarian school reformers towards sex education. They decided to include different aspects of the topic in the various school subjects, from religious instruction (sexual ethics) through biology to the fine arts (nude in works of art), 'Bayerisches Staatsministerium, 1970).

In a similar approach a group of English teachers convened to explore the place of science in envrionmental science, assuming that the same should be done for other subjects. (Association for Science Education, 1974). They felt that:

"... the specific contribution of the science area of the curriculum should be:

1. to establish the major scientific theories about matter, energy and living things.
2. to use these theories to explain natural processes, cycles and controls at work in the world system.

3. to show how the application of scientific knowledge does and could affect "natural" environmental systems, individuals, communities, world development.
4. to examine the interactions between science and technology, environment, communities, economics, politics and value (belief) systems. Thereby show that decisions concerning science and technology involve other considerations outside these two areas which may be of great importance and public interest.
5. to help to develop the knowledge, skills and attitudes involved in forming an opinion and in publicly expressing it."

Many of these recommendations, which were originally directed towards science teachers, are not so specific for the science area. With a minor change in context and point of view and a small shift in emphasis they apply as well to other subject fields taught in school.

In both cases, when a new field of study is introduced into school, as well as when the environmental topics are divided up between the existing subject matter fields, a close cooperation between specialized teachers is of paramount importance. Without it environmental education will be lame. In many places much progress has been made with team teaching in one form or another. Teachers, who used this technique, got to understand better each others' point of view. Team teaching is still a strange thing to many teachers and future will show how specialized teachers will create patterns of environmental team teaching.

Other Frameworks for Environmental Education

In all our discussions how to organize learning activities in environmental education effectively and how to integrate them in the over-all curriculum, we should not forget our central goal. The understanding of problems is only the starting point for building up positive attitudes, the will and skills to work

towards balanced solutions of environmental problems. Therefore the induction of a deliberate and practical commitment to the improvement of the environment must be an integral part of environmental education. It could well be that extra-curricular frameworks, which are more flexible and less knowledge-centred, will be more suitable for our purpose than the formal set-up of most of our schools, in which the contact between teacher and students is more restircted. At least on first sight it seems that special circles or clubs would be most suited. They could attract students of different abilities and interests. The teacher-leader in this framework can make more allowance for personal inclinations than in the formal lesson.

Students in academic streams might be interested in suggestions, how to prepare thesis papers (instead of a Bagrut examination). Other suitable frameworks are the Bagrut examinations themselves, into which environmental problems could be included, camps for youth interested in environmental problems and environmental science fairs. The topics of such a competition could come from two complementary areas;

1. Development of methods and apparatus for environmental investigations.
2. Exposition of projects which have brought about an improvement (even a small one) in environmental quality or could feasibly do so, if they were implemented.

Education Hour of the classroom teacher could be an auxiliary mean, if properly used. Its scope is not wide enough for a thorough investigation of environmental issues (for which purppse also the classroom teacher's knowledge is usually unsufficient). Yet Education Hour could be very relevant as a focus for fostering positive attitudes by planning and executing activities, which could ameliorate something in the community, to which the school belongs.

Trends in the Curriculum Units Developed in Israel

During the last few years some environmental curriculum units were also produced in Israel, and not only in the natural sciences. These units show

two developing trends: Infiltration of environmental education into more subject matter fields than was the case before, and a trend towards breaking up the boundaries between the classical subject matter areas. The following is a short description of some of these units:

1. "Garden in my room" - In this unit children grow plants, which can be found in each kitchen (beet, sweet potato, onion etc.) as ornamentals in their room at home. The unit was developed as part of the topic "In the house" and will be built into the social studies curriculum for grades 2-4. Also the topics "Around the house" and "The quarter" (or "the village") are part of this draft curriculum.

2. "How to grow plants"- This teacher's guide on simple garden techniques for primary school teachers is still in its development stage and will be tried out during a Matal inservice training, before being released.

3. "Plants in your home"-In the framework of Environmental Studies and Agriculture sixth graders will learn how to grow home plants and ornamentals. They will take the pots home and investigate there, which is the most suitableplace to grow each species.

4. "Let's Grow Plants" - This course is given in grade 7. A substantial part of the course is on plant propagation and experimenting with flowers. Among the subjects, which have a special environmental aspect, is the protection of epiphytes.

5. "Excess nitrate in water"
This unit deals with the nitrate pollution of water, its effect on babies and lakes, and ways how to prevent the pollution. It will complete the chapter on the use of artificial fertilizers in "Let's grow plants". Students discover that excess fertilizer is not only harmful to the pocket but also to plants and ground water quality.

6. "Prevention of cruelty to animals"
This module was prepared by a joint team of the Curriculum Center and Bar Ilan University, as as part of the Oral Law curriculum for religious schools. After a discussion of the religious laws against the cruelty to animals students check if experiments done in school do not break these laws.

7. "The forestand water"-and similar chapters for further reading, which belong to the "Plant and water" unit of the 7th grade biology curriculum, present environmental issues, on which public opinion is split.

8. "Man and water" - is one of the main topics in 9th grade biology. It centers around water pollution, The team from Haifa University, which prepared this unit, developed water pollution experiments, teacher guides for excursions along rivers and an educational game.

9. "A fly, DDT and Us" - this curriculum unit is about pesticide pollution and alternative ways of plant protection. The reasons, which influenced "the rise and fall of DDT" are discussed and problems like resistance and biological control are investigated. Students look at the problem from the points of view of both the producer and the consumer. The "Silen Spring" controversy serves to initiate an exercise, in which students learn to differentiate between facts, commentaries and propaganda. This unit is given in 8th or 9th grade, in the frameworks of either Environmental Studies and Agriculture, or in Biology.

10. "Arranging flowers"- is now a subject in 8th grade Home Economics. Relevant instructional materials for students and teachers were prepared.

11. "Our environment" - a unit, which was developed by Matal in Tel Aviv University, is taught in elementary school as part of the Nature Study program. It has sections on most pollution problems.

12. "Chemistry in modern society"
is a text prepared in the Hebrew University of Jerusalem for the secondary school students, who choose a humanistic strand. It deals i.a. with air pollution.

13. "Fight against hunger"- if we take environmental quality in its wider sense, as human ecology, we should include the world hunger problem and the ways to fight it among the most serious environmental issues. The peak learning experience of this curriculum unit is the simulation game "End to hunger", which was presented in one of the workshops of this conference.

Conclusion

We are only at the beginning in environmental education, and shall have to invest much effort in order to create effective patterns in this new, but quickly developing area of education. So far most instructional materials, which were developed, were mainly ecological. New approaches are crystallizing and environmental education is starting to infiltrate also subject matter areas outside the natural sciences. Learning activities should be centered around real and relevant problems, if possible from the environment of the student, and interdisciplinary in their approach. The goal of environmental education will be reached when students will analyse a situation, come to a balanced decision what can and should be done, and will act within the limits of their possibilities, in order to improve the quality of their environment. To attain this goal teachers are needed, who are both committed and have the necessary knwoledge and ability to lead their students. To quite some extent they will be able to do so through team teaching strategies and by using many possible frameworks. Within formal education the potential of special Environmental Studies should be further explored, but environemtnal foci in all school subjects should be exploited. Circles and clubs for the improvement of the environment, teacher colleges and pedagogical centres, contests and project work are other frameworks, which could be used effectively in environmental education.

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PROBLEMS OF ENVIRONMENTAL EDUCATION AND THEIR IMPLICATIONS FOR EDUCATIONAL PLANNING

by

Miriam Ben Peretz

Even though environmental problems are central to the life of man in our era, many difficulties arise in struggling with these problems through educational endeavors.

It is possible to divide these difficulties into three main groups:

A. Difficulties whose source is the school.
B. Difficulties which derive from the nature of the educational process.
C. Difficulties which derive from thenature of the subject of environmental quality.

Lesson planning in the area of environmental education must be done with awareness and sensitivity to these problems, otherwise the goals of the programs, awareness of environmental problems in their entirty and personal readiness for action aimed at environmental quality preservation won't be achieved.

Below we will try to specify the various difficulties confronting the planners, and the effects arising therefrom, as they are expressed in the learning material that was prepared in the curriculum framework of "Man in Nature".

A. Difficulties whose source is school

The environmental education effort is focused principally upon the framework of the educational system, with all its advantages and limitations. It is important to make the teachers aware of the underlying difficulties within the reality of school.

1. there is a sort of hidden barrier between the outside world and life in school (Liebard, 1965, Bellack, 1967). For the majority of students the subjects which are studied in school constitute a totally different

framework which is irrelevant to all that occurs in daily life. The emphasis on theoretical concepts and the dichotomy which prevails in the school between theory and practice is liable to obscure the meaning of the material which is taught and prevent its "translation" into daily practice. As a response to this difficulty, the planners of the program "Man in Nature" are trying to present the different topics in contexts which draw on the lives of the students. For example: in the unit "Man and Water" the subject, the quantity of water man consumes, is brought up while checking water bills which the children are requested to bring from home (Man and water, 1974). Diversified activities are suggested to the teacher which bridge the gap between "school" and "the world" such as : contest of photographs of environmental mistreatment, gathering newspaper clippings, visit to a water purification installation, a tour and survey of dwellings to determine the degree of concern about water distribution. (Man and water, teacher's guide 1, 1974).

2. Teachers and students have personal priorities with regard to the importance of ecological problems in relation to other problems. For teachers, top priority might be given to diversified objectives such as: imparting broad education to students, development of intellectual capacities, expansion of good interpersonal relationships and development of the learners' personality. The teachers might be bothered by the multiple educational problems, lack of national consciousness, impatience, and lack of personal identification on the part of the students. The problem of environmental education is not always the students' major concern. They have their own problems, especially during adolescence, the period in which the program "Man and Nature" is taught. The extent of their awareness ans readiness to be involved in general environmental problems is liable to be slight. This situation imposes a burden on all who try to teach environmental educational efficiently. The planners see great importance in the effort to overcome this difficulty, in creating a scale of values for teachers and students alike. This awareness is achieved in different ways, such as: questionnaires for teachers, debates which revolve around analysis of excerpts of literature and recommendations to hold "public trials" on environmental topics.

3. In the immediate environment at home, in the street, and in the school, the learner does not come across many meaningful positive experiences that argue for preservation and improvement of environmental quality. Frequently the school is neglected, the courtyard desolate, and the street dirty and noisy. The learner lacks "models for emulation" in the environmental subjects. The seriousness of this difficulty should not be ignored. Not to practice what one preaches is a vice especially in education, and is liable to sabotage any educational endeabor. The concomittant experiencing of this phenomenon strengthens the gap between learning and doing, between more words and the acceptance of personal responsibility for daily behaviour. It is not within the power of a curriculum limited to a small number of hours during one academic year to solve this problem. This sincere attempt requires an all encompassing effort by many of the authorities involved in school life. The little that the planners can do is to suggest to teachers to direct their students towards projects for beautification of the school district or of residential areas. Indeed, there are schools where beautification projects are carried out by the students and teachers. In this way the students are given the opportunity actively to experience environmental beautification.
4. In school one does not deal with these problems but rather one learns "subjects" (Martin, 1970) . Environmental problems are found in a so-called "nomansland" between the studies of nature, geography and citizenship. Few hours are set aside for the treatment of topics in the field of environmental quality, and these generally, in nature lessons only. In this way, the student does not see the full extent of the problem and doesn't get a complete picture of the factors which influence his environment - physical, biotic and human. This problem is beyond the capabilities of the planning crew of the topic "Man in Nature" and requires genuine changes in the general curriculum. The planners tried to present to the students something of the richness and the complexity of environmental problems by utilizing different fields of knowledge and expressing them in the study material. The unit "Man and the Landscape" is rich in its treatment of historical events, artistic expression and mutual relations between man and his surroundings.

This unit might serve geography lessons and lessons in the history of man in the same way that it is meaningful to nature lessons. The curriculum "Man in Nature" tries to place before the student a number of problems which require of man diversified knowledge, a equitable social system and a background of well-founded values.

B. Difficulties which derive from the nature of the educational process

In each attempt to educate for a certain behaviour, the educator runs into a number of serious practical and ethical problems.

1. There are objections to the position that there is a right to educate toward requried values (Kleinberger, A.P.; S. Yzhar, 1971). Here the question arises in all its severity. To what extent is it permissible for the educator and the teacher to become involved in the shaping and consolidation of the value system of their students. In a subject with such far reaching meaning for the future of man as environmental education, there is no escape from the conclusion that no society can allow itself, under modern conditions to forego education for positive values in the sensitive area of preservation and care of resources and environmental quality. In the light of this approach, the planners don't doubt their right to expect that the idea of environmental quality will not be used just as a title for a chapter in a school book, but rather as a guiding principal for responsible behaviour in our private and public lives. In the program, a great emphasis is placed on reasoning exercises and "translation" of knowledge attained into just decisions in daily activites.
2. Knowledge of good is not a guarantee for ethical behaviour. A man can be familiar with ecological processes and able to form far reaching conclusions and may neverthelsss not act on the strength of this knowldge nor in accordance with these conclusions. Consequently, the problem of "translation" of knowledge into a pattern of required values for daily behaviour exists. Actually the choice which stands before man is not one of clearly good or clearly evil; in every decision there is a conflict of opposed values. Behaviour which is

said to be based on a system of valued considerations which derive from consciousness of environmental problems requires a capacity of "translation" of principles to meaningful action. How is it possible to develop these capacities? Schwab and Cohen (1965) specify what the difficulties in "translation" of ethical principles to practical personal decisions are. They emphasize the need to cultivate the intellectual ability to struggle with problems and suggest an educational way to exercise the application of principles to situations drawn from daily life. This way might foster the ability in the student to accept ethical decisions. The planners of the program "Man in Nature" intend to go this route and to increase exercises in which the student is required to define for himself which are the environmental principles liable to occur in different life circumstances and what can be deduced from them regarding personal behaviour.

3. Before each educator stands the problem of evaluating his educational work. In a subject with educational implications such as the subject of environmental education one should not express evaluation processes through examination of learning achievements which are focused on understanding concepts and principles. We expect environmental education to bear fruit through a meaningful change outside the walls of the school in the long run. It is hard to evaluate changes in the area of attitudes, approaches and deeds. Examination of educational success in the area of attitudes and approaches is the most difficult. Nevertheless the planners placed the goal before themselves, that the educational effort invested in the topic "Man in Nature" will be accompanied by a follow-up whose central question is to what extent can the students translate the learning material into deeds and to what extent concern for environmental quality is manifested in their lives.

C. <u>Difficulties which derive from the nature of the subject - environmental quality</u>.

In organizing a field of knowledge a number of serious problems stand before the educator:

1. Problems of environmental quality are most complex from a scientific stand point. Knowledge which is required for familiarity with environmental processes is accumulating in diverse fields, and a substantial part of it requires delving into much that is beyond the ability of many students. This situation might cause the educational treatment of environmental topics to be shallow, based on dicta which are not founded on established facts and which lack scientific validity. To combat this difficulty, the planners of "Man in Nature" emphasized qualifiable measurements, as expressed in a unit of "Man and Water", which is rich in experiences that require quantitative measurement. The topic "Man and Water" is presented as a case study which exemplifies the problem of pollution of resources and their destruction. The students face an array of factors, chemical and bacteriological which effect the quality of water. The problems of water usage, water purification, and different causes of pollution, were brought to their attention through an array of experiences. Also the students are required to struggle with the decision making process "as supervisors of the water quality of Lake Zuk". Three alternative programs are presented to them for the reduction of pollution in the lake and they must explain the program they choose. On the basis of comparative data from examinations of two lakes, the students are required to determine which lake is more seriously polluted and to justify their claims. Every didactic measure which is taken by the planners should aid the student to get a meaningful, valid picture, scientifically speaking, of the totality of factors involved in each problem of environmental quality.
2. Study of ecological problems leads to knowledge of the serious problems of existence which are a result of man's interference with his environment. The student discovers that the suggested solutions are still few and their realization is frequently hindered by difficulties which derive from economic or social considerations. This situation is liable to bring the student to utter despair, seeing the situation as uncorrectable and having a sense of impotency and hopelessness. Because of this phenomenon, the program planners

accepted as aximatic the principle that, in the curriculum "Man in Nature", the possibility of affirmative environmental action should be emphasized. The unit "Man's Uniqueness" constitutes a central element in the program because it focuses on the immense human potential hidden within the human brain. The unit "Man and the Landscape" introduces the student to preservation and cultivation which can be performed. The tone of the program "Man in Nature" is not that of presentiment but of an optimistical vision of man's ability to accept responsibility for preserving the ecosystem in which he lives.

3. Man is a creature with a great capacity for adaptation to the most varied environmental conditions. Students who live in a noisy, crowded metropolis under conditions of serious environmental pollution are not necessarily aware of it. They are used to their surroundings and frequently accept this environment without complaint. Teachers who taught the topic "Man and Water" reported that during conversations about environmental elements, the students expressed the approach that noise does not constitute a disturbing factor to them and even indubitable environmental harm is now grasped entirely in all its seriousness. Indeed, we are not laying down a single treatment of what is essentially a value subject such as environmental quality. Moreover, it is incumbent upon us as educators to be aware that acceptance of reality as it is might sabotage intended improvements. Under these circumstances the planners must plan learning opportunities which demonstrate environmental problems in all their severity. The tour along the river which is an important element of the unit "Man and Water" is intended to serve this purpose. During the tour, the students use quantitative experiments in order to determine water quality, and in that way, putting into practice what is learned in the laboratory is validated. Moreover they have a strong emotional experience of shock and even repulsion from water sources polluted by man.

By means of this experience and others, the planners hope to increase the awareness of the learners of the environmental quality of their lives.

The problems presented are part of a totality of problems which stand before all who want to struggle with environmental education.

The difficulties are many, as we said, but for the performance of environmental eudcation the words of our wise men apply: "You needn't finish the job, but you are not free to avoid it".

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DIFFERENT APPROACHES TO ENVIRONMENTAL EDUCATION

by

Menahem Zaharoni

Here in Jerusalem there lived a tragic prophet who had been destined to see it destroyed. He also saw the destruction of the land whose capital it had been, and the exile of the people. But as he had strong faith and love for his people, he predicted the beginning of its resurrection: "And I shall assemble them from far-away, the blind and the amputated, the pregnant and the one who has given birth - all together, a big crowd shall come back here" (Jeremiah, 8, 33). It is a pity, though, that this prophet did not predict how all the blind and the amputated will reunite to form one normal people in a homeland which will be rebuilt. These issues are very relevant also to the second return of Jews to Zion.

A strange discussion took place in this conference: F.Sutman was optimistic in relation to what is happening here in environmental quality. An Israeli woman, however, had opposite opinions: she claimed that the situation here is as bad as it can be. There could not be any doubt as to who she was blaming for the existing situation, and the impression I got was that she was not blaming herself. Both approaches are educationally wrong. Ignoring reality is a bad habit, but taking reality as it is while standing aloof is even worse.

I think that Berl Katzenelson (an Israeli leader of the first part of this century) has written about our situation in both a poetic and a realistic manner. He knew that all kinds of people were re-assembling in our land, among them "man-worm". "And thou shalt make a man out of the worm, a people out of the man and a country out of sand". It is ridiculous to compare our situation here with the state of well-formed nations who have been settled in their land for many generations. However, there is not any other example suitable for our situation, to which we could have compared our achievements and failure. We still do not have in Israel a well-formed state and

united nation. We should create them. If anyone assesses the situation considering reality, he can perhaps claim that what we do have here is a great miracle. It might have been much worse. But with all the consolation this thought may give, we absolutely should not take the existing situation, including environmental quality as it is. We should advance in all fields. The reason for not enough progress recently (even compared with the progress made during the Mandate) is the Israeli inclination which did not exist during the Mandate, to lay the burden on other's shoulders. Who should educate the Israelis? The common answer is: "You and him", and mainly "the Government" and "the institutions", but not "me". I, personally, do not accept this attitude and I am trying to do whatever I can. My responsibility hurries me to action and if I do not perform enough, and if the situation in many respects, including the attitude to environmental quality, makes me sad, I then feel that I am also to blame for it. This feeling of guilt is a motivation for action. I suggest that everybody in this conference accept this position. This is how an educating nucleus will be formed. An Environmental Quality Education Center should be built on this basis; otherwise it will be still another institution to be blamed.

Environmental Quality Education is an integral part of education as a whole. Changing the public's behaviour with regard to environmental quality does not depend, for its most part, on logical explanations. Penalties will not achieve the aim either; for not only is penalizing criminals not education, it is also not realistic in terms of the number of policemen required to do it.

Educating people for better preserving of environmental quality should start with babies, at least with children in the Kindergarten. It should go on during all life's stages, using methods suitable for each stage. The main problem is only how to educate, what methods to employ. There is a danger of mingling education with learning and getting learning instead of education. Today learning is in most cases not to be identified with education. Acquiring any kind of information concerning problems

of environmental quality, the dangers of polluting and destroying the natural environment , even in the form of studying the subject as part of a respectable and committing profession, cannot assure a desired behaviour of the individual. It may even be that the motivation for the study of this subject, which will probably include suitable sections in chemistry and physics and their relation to man's physiology and hygiene, will be stronger than the will to study other topics. This is so because it pertains to the learner's health. Nevertheless, there is almost no doubt that this is not the way to attain significant achievements in the individual's behaviour. The problem of smoking can serve as an example. Everybody is familiar with the dangers of smoking and, nevertheless, the number of smokers is not getting lower. Man's abuse of environmental quality is always immediate and is a result of man's laziness and of his egoistic demands. Preserving environmental quality as a personal motivation is a long term task. Man does not feel directly the result of any harm done to the environment (which will eventually affect his health). Environmental quality education requires thourough and patient work, and this has not been stressed enough in our symposium. It has to be based not only on common sense, but also on all mental powers, communicative, affective and behavioural. A child should be made aware of his relationship with the environment from early age, and with due consideration to the aspects of education, mentioned above. With such constant awareness, there will be a better chance for achieving long term outcomes. The starting point of any curriculum in the natural sciences, in geography, should be the study of the environment. We do not need so much learning and studying in the laboratory, be the problems even the most current ones in modern biology. What is necessary now is the study of the environment's phenomena outdoors, completing this study in a lab. In observing the environment, aesthetic and emotional elements should be emphasized, imagination too. For God's sake, do not only teach "cognitive" science as is common today, even in elementary school and even in Kindergarten. Learning about the aquarium and exploring the behaviour of white mice are not suitable for elementary school. If the child is to acquire a humanistic approach to the environment, he will gradually avoid

the thought of abusing it. He will not be able, mentally, to pollute it with waste, for instance, just as he would not go to the toilet in public.

A cognitive "useful", "hygienic" approach will not result in such an improvement. I'll venture to call my approach a humanistic, cultural historic approach. It is based, naturally, on the whole mental powers of man, and not on logic or analytical thought alone. A general cultural approach includes, of course, hygieny, as well, but it is much more than that. It contains considerations of non-materialistic cultural values. Such an approach will bring about the preserving of scenic elements and historical monuments in a suitable way, even though there won't be any material advantage in preserving them. Sometimes preserving them will even involve material losses. This approach will feed intelectual curiosity. Why worry only about air pollution caused by the smog in "Nesher" factory and by the gases emitted from the purification plants in Haifa? Why not worry also about preventing pollution in the sea not only in order for us to be able to bathe in it, but for the need to maintain life on the beach? Why not have a pure river in place of the Kishon, which will support common natural animals and plants in and around it? People will enjoy it and see what this place looked like for thousands of years. Near Haifa and Acre there are salt ponds and palm trees, which have existed there, as historical sources tell us, for more than 800 years. Why are we letting them gradually degenerate, until soon there will be nothing left of them?

How will the child understand that the international road from Egypt to the lands of Prat and Hidekel (the Sea Way) went along Eeron Valley, when today, according to common sense, it should have crossed Haifa? It will be hard for him to grasp it if we do not have anything left of the swamps which made the latter alternative impossible. A humanistic approach to environmental quality education will emphasize the relation between man and the environment throughout the ages and in the present time as well.

This relation, according to that approach, considers both a continuation of the past and changing the past to be important. However, the extent of the changes should be limited, in order not to disconnect the line of history and man's existence. It should be noted that there is no clear-cut borderline between the "hygienic" and the spiritual-aesthetic aspects. Going out of urban areas, which are piled with men and industry, towards open views, was once considered only an aesthetic, almost romantic need. Today it is already clear that it was also a "health need", the need to relax the mental stress and the stress over the eye muscles. Today we are planning green areas in cities. Waterfalls are beautiful, but are healthy, too, because of the negative ions contained in the air around them. It is possible that what is thought to be only an emotional experience of romantic value today, will eventually be considered a vital health need.

I would like to reemphasize the danger of conventional education. Under the influence of different factors, there might be a new program for the study of problems in environmental quality, suggested by the Ministry of Education. The program will probably be built in the form common to the programs in the study of nature, and may even be part of the matriculation exams. As it is, we can accept with some satisfaction the program for ninth grade, which is being developed at Haifa University. It is called "Man in Nature" and it includes humanistic viewpoints and emphases, although these are not arranged according to regions, and do not possess all the aspects mentioned above. Still, environmental quality education is a new field in education. Therefore, there is some chance that it won't be given in the same ordinary fasion, characterizing education today.

Perhaps it will be worthwhile to mention another area, to which environmental quality education, in its humanistic trend, can contribute (at least something). Snow a British physician and author, described, in his novel series "Strangers and Brothers", the lives of people who have free professions. His article "The Two Cultures and the Scientific Revolution" caused a serious debate in the world. It posed another severe problem for education.

The humanists of today do not have a suitable knowledge in modern natural sciences, and most of them do not even understand the principles of modern science. Most of the natural scientists nowadays, have given up even the least knowledge of humanities. There is a gap, then, between these two academic types. The humanists use old categories of thinking, and the natural scientists lack a very important aspect of man's life. There are exceptions, of course, but I am referring to the general phenomenon. Education is more interested, though, in the non-academic section and in the section of university graduates who are not scientists. Literature is not studied as an educational-humanistic value in high school and university. It is learnt as an objective subject, as if it were a science such as physics. Technical problems in literature, and not the educational power of it, are emphasized. In high school, literature is a subject for the matriculation exams and it is usually a burden to be overcome. It is hard to find graduates who majored in the humanities in high schools, for whom literature is an important value after they have finished high school. The spirit has been out of humanistic education nowadays, because nobody educates for humanistics: they all teach it. Those who major in math, in biology and in the physical sciences get very little humanistic studies. Graduates who majored in the humanities had elected to study there because they were not able to stand the requirements of the biology or physics courses, not because they appreciated the humanities. Humanistic studies are considered as having less prestige than the study of science. This is not the time to give a detailed speech on the kind of culture which is produced by high schools and universities. The humanistic cultural-historical approach to environmental quality education can contribute to the improvements of the present situation. It can arouse the motivation of all high school pupils, for an honest interest in both humanistic and scientific cultures. They will come to bridge between the two, for these cultures are both vital to the existance of Man.

CURRICULUM AND TEACHING IN ENVIRONMENTAL EDUCATION: A Process Ofientation

by

Patricia Sparks

and

Frank X. Sutman

Much activity is occurring in the United States, in Israel and in other countries in developing environmental education curricula for the school and college level. The curriculum movements of the 1950's-1970's in the United States and later in Israel indicate the importance of how these materials are presented in the classroom. We rediscovered that there is no teacher proof curriculum. That the curriculum materials are one matter, and that how they are presented by teachers is another.

This introduction to a series of environmental activities accepts the above premise; but it also supports the idea that curriculum materrials can be developed which lend themselves to the process teaching oriented classroom. What is meant by process teaching? We know that John Dewey used the term process interchangeably with problem-solving. And historically the steps of the scientific method have been viewed as processes. As early as 1941, but beginning seriously with the late 1950's process: problem-solving and the scientific method have been applied to science teaching. In all of the nationally developed curricula in the United States, funded mostly by the National Science Foundation, process means the solving of theoretical problems of interest to scientists. With the reemergence recetly of environmental eudcation a new dimension has been added to the meaning of process in teaching. The Environmental Education Act (P.L. 91-516) itself recommends that environmental education stress problem solving. Sidney Marland, former U.S. Commissioner of Education, elaborated on the definition of environmental education in

"Environmental Education Cannot Wait," American Education, May 1971. He states that "Environmental education is directed toward attitudes, and therefore, the emphasis is on process...".

The Congressional Committee involved in drafting the Environmental Education Act believed that good environmental education should include the following characteristics:

A multidisciplinary approach, with emphasis on the inter-relationships of man and nature;

A focus on contemporary problems relating to the urban and rural environment - man made and nature;

Incorporation of non-formal as well as formal education processes and utilization of resources outside the classrooms;

Development of understanding and attitudes as well as information;

Involvement of all age groups; and

A participation centered design, involving each learner participant in choosing priorities both as to the issues to be studied and the solutions that seem appropriate.

As we examine the term process in teaching about the environment it becomes evident that a concrete definition should be used which can also be applied to the development of curriculum materials. For this purpose it is most useful to reconsider the old steps of the scientific method; stated in terms of specific skills. In preparing to consider these skills it is helpful first to define a process skill as: a specific physical or mental process that when integrated causes actions which can affect change. In this context then the process skills applied to teaching about the environment are:

Observation Skill: Involves the initial recognition of objects or factors to be considered in dealing with a specific problem. Observing may also involve noting past experiences or factual information which bears on an environmental problem or problems.

Classification Skill: Involves placing an observation into a category. In order for an observation to fit into a category it must meet certain criteria which distinguishes it from other categories in use. Classification goes beyond observation in that the characteristics of the observation need to be deliniated before the observation can be classified. In addition, each category into which an observation is classified must either have equal stature or be considered a sub-category.

Comparing Skills: Observations and categories are compared. Quality factors play a major role in comparing observations and the categories into which they can be grouped. Comparisons not only provide for an extension of data about the environment but they surface questions which can provide the basis for further environmental study.

Questioning Skill: As students move to a higher level of awareness questions will arise from classifying and comparing observations. These questions then set the basis for further study of the environment.

Measuring Skill: Measurement techniques are used to extend observations and may include diagramming and graph making as well as number manipulation. Numbers representing observations of environmental phenomenon can be manipulated to reflect relationships in concrete terms, enhancing the observations.

Inferring Skill: Inferences regarding the environment are considered a step upward from direct observations because they usually require subtle observations; the "it seems that" form of observation. Inferences are generally based on information gathered beyond direct observation, i.e., from classifying, comparing, questioning and measuring. Students are able to make inferences when they are able to arrange information intellectually into patternrs of thought. Inferences

involve making interconnections in data. Inferences may lead to the development of hypotheses which can provide the test ground for the inferences.

Predicting Skill: Predictions of the "what if we change or vary this factor" variety are based on data collected through observation and measurement. Very simple to more complex graphical representations of data provide a common framework from which predictions can be made.

Designing a Plan of Action Skill, formally referred to as Hypothesis Development: If environmental education and environmental projects are to get off the ground, designing a plan of action is one of the most important process skills to be developed. The word hypothesis is not given emphasis here as in historical descriptions because the word hypothesis implies dealing with theoretical problems. While environmental projects can be theoretically oriented; for the school level the emphasis should be more on the practical level if students are to be motivated.

Data Collecting Skill: Is considered part of an experimental process involving designing a plan of action, data processing, and data evaluation. These three process skills are often referred to as "Integrated" processes. Recording of information differs from data collection in that the parameters of data collection are based on the design of the action plan while the recording of information is far less restrictive.

Data processing Skill: Is an extension of the proecess-skills mentioned above as it calls for comparing, categorizing and inferring. More advanced students who become involved in developing this skill interpret the results of their experiments and deal with different ways of explaining results. Data processing is part of the experimental process and is thus considered one of the integrated processes noted above.

Data evaluation Skill: The final process-skill calls for application, explanation and testing of an action plan. Students view, objectively

their data, interpret the meaning of that data and finally evaluate the significance of that data in terms of recommendations for action. In environmental studies this is usually of significance to society.

It is clear that thinking in terms of process skills rather than simply process, particularly as it relates to environmental education, is in reality refinement of earlier definitions of process. These skills are most important to consider when developing curriculum activities in environmental education. Placing them in a diagram or model to be followed is also helpful. Of course such a model is fluid or changeable, but might look as follows:

A Process Skill Model For Environmental Education Activities

			DESIGNING A PLAN OF ACTION
	CLASSIFYING	MEASURING	
OBSERVING	COMPARING	INFERRING	(HYPOTHESIS
	QUESTIONING	PREDICTING	DEVELOPMENT)
		QUESTIONING	
			DATA COLLECTING
			DATA PROCESSING
			DATA EVALUATION
	QUESTIONING		SUMMATION OR
			CONCLUSION

It is being proposed here that activities or curriculum projects in environmental education should not only deal with the practical problems of our environment but they also must be designed to teach the process skills that are important to science and related fields. Joseph Schwab recently referred to applying process in the solution of practical problems as practical inquiry.

Keeping in mind the diagram relating process skills it is now useful to examine the following outline for developing process oriented curriculum materials in environmental education. Each activity should contain the components that follow:

I. Introduction

II. Objectives

III. Questions
   1. To introduce the activity
   2. To initiate the activity
   3. To continue the activity
   4. To expand the activity.

IV. Equipment

V. Procedure

VI. Limitations

VII. Reference

The introduction to the activity serves to state the type of activity, the focus or main concern of the activity and the need for any special equipment. It further indicates the time needed to complete the activity. The objectives of the activity are useful statedin behavioural terms and should focus on the particular concept(s) being developed.

The questions allow teacher and students to begin an activity at their own level of expertise and understanding. The first group of questions introduce or lead into the activity. They are intended to direct thinking toward the problem to be investigated. These questions should be primarily broad based conceptual questions which introduce the problem. They generally draw on previous observations and may call for comparisons and classification of data.

The questions which initiate the activity require some preliminary action. This action may be to find some vital information or source of information. In many cases the questions cannot be answered adequately simply through group discussion and, therefore, require further investigation. At this point content is introduced into the activity as needed, by seeking information from available resources. In seeking answers the students frequently deal with the process skills of questioning, observing, comparing, classifying and inferring.

The contiuing questions are considered while the activity is in progress, for they guide and reinforce the activity. These questions generally can be answered by performing the activity. In some cases supplementary resources will be needed. The activity and questions may deal with all of the process skills as they relate to a specific experiment; or they may only involve data collection from which questions might arise which would lead into a problem investigation at a higher level. Once students become involved in the activity it may go in many directions. There can be no presumed answers when utilizing the process approach to teaching about the environment. This point is so crucial, and one that is ignored by so many teachers that claim process teaching.

The expansion questions provide for further study. Each question allows for independent or small group study and can generate a wide range of suggestions on managing further investigations. Each question should provide the lead for at least one other activity.

Note that the procedure itself is purposely given lower priority than questions. That is, questions and not procedure provide the structural foundation of each process oriented activity. Only through conscious acceptance of this idea can the specific process skills be used in problem solving. And in this way process skills are developed and reinforced.

The section of each activity on limitations provides hints to the teacher, problems which might be avoided if certain steps are taken, and restrictions which might be considered. The main purpose of this

limitations sections is to help teachers avoid many less obvious considerations which might lead to unnecessary failure of the activity.

Finally an annotated bibliography should be provided at the end of each activity. This is intended as a resource for answering the questions given in the particular activity.

With this general background we are now ready to become involved in four sample process oriented environmental activities. These are appropriate for use in most school environments including teacher education programs designed to teach the skills indicated in this presentation. As you proceed through these activities be cognizant not only of their environmental implications, but also of the process skills each activity emphasizes.

MUTUAL RELATIONS IN THE ECOLOGICAL NETWORK
(SPIRAL DEVELOPMENT OF CONCEPTS)

by
M. Silberstein

Mutual relations in the ecological network form a composite picture which contains many elements whose relationships are in dynamic equilibrium. An in-depth understanding of this picture requires, on the one hand, knowledge of many concepts in the field of biology, chemistry, physics, earth science- meteorology and more, and on the other hand, a substantial ability of abstraction for understaning the complexities of possible relationships.

In the new curriculum for biology instruction in the middle school this picture is built up gradually, by means of accumulated knowledge that broadens and deepens the understanding of mutual relations in the ecological network.

This occurs in two senses:

a) addition of new elements to the picture, and
b) repetition of known concepts for deepening the meaning (see the concepts marked with one, two, or three asterisks below).

The following is a list of concepts and ideas in the order in which a student is likely to encounter them:

7th grade

Topic: Animals and their Environment.

Chapter 4: -classification based on sources of food: herbivores, carnivores, and omnivores.
- food chain (with regard to a linear relationship)
- food web (with regard to a network of alternative food chains)
-* producers (with regard to the first member in each food chain)
-* consumers (with regard to members of the food chain which depend on the producers)
- interference by man - disturbance of a member in the web

- causes a chain reaction and upsets the equilibrium in the web

Chapter 7: -* ecosystems - an independent ecological system which maintains itself within such a system are: producers, consumers, decomposers and a stable environment.

- in a closed aquarium - circulation of materials in a closed system. Relations among the members of the system are of movement and exchange of gases.

8th Grade

"The Plant and Light" ** Producers - green plants which are able to transform light energy to chemical energy, which is stored in organic substances - photosynthesis.

** consumers - derive nutrition from the organic materials produced by the plants - respiration

** circulation of materials in an ecosystem - closed cyclic system

** energy flow in an ecosystem - unidirectional open system. Food pyramid decrease of the quantity of available organic material in passing from one nutrition level to another. Limited length of food chain.

"The Plant in its Habitat" the indivual and populations

- interspecific and intraspecific competition
- approaches (nutrition, reproduction, etc.)
- development of plant and animals societies
- developing ecological systems
- ecological systems at climax

Grade 9

Resources and energy in the biosphere

*** flow of energy in the ecological system - quantitative calculcations. Influence of man's interference on the ecological system (primitive societies, developed societies).

SYMPOSIUM ON DIFFERENT APPROACHES TO ENVIRONMENTAL EDUCATION

THE TASK OF THE UNIVERSITY IN THE ENVIRONMENTAL CRISIS

by

Zvi H. Evan

1. Youth and the Environmental Crisis

The environmental crisis which afflicts the industrial world left its mark on the young generation and awakened within it reactions of alienation of different sorts. Sometimes we witness abandonment of scientific and technological study to a great extent, in favour of art and philosophy. Indeed, the reaction even approaches a refusal to see acquisition of knowledge as a means for the advancement of man and in its place comes a desire for return to the pre-industrial social structure, primitive and supposedly more natural. Patterns of behaviour and unscientific, mystic dogma take hold of youth, which leads to non-participation in any popular social economic activities (dropouts). These manifestations prove clearly the limitations of the educational system as it exists today.

Truthfully, the destination of education was, and still is placed in mechanistic affirmation of each scientific and technological development as a step forward towards a better future. It's enough for youth to observe the accompanying effects of that "progress" such as environmental pollution and the deterioration of living conditions in the noisy metropolis in order to awaken serious doubts in his heart, not only towards the consumption which occurs in technological development, but even the essence of the concept of progress.

2. The Dimensions of the Crisis

The environmental crisis derives mainly from two basic factors: the glorification of man's force of influence to leave an impression

on the environment, and on the other hand the failure to suit his perception and his methods to his great strength. According to Platt, the head of the Mental Health Institute for the University of Michigan, in the last hundred years, man has multiplied his ability by 10^2 with respect to speed of movement and destruction of pathogenic bacteria, by 10^3 for pumped energy, by 10^6 for the killing power of weapon and the speed of communication by 10^7. As a result human activity spreads over a broad area. Even in the past, man destroyed by wars or by exploitation of entire areas such as Aram N'harahim, the Jundah Mountains, or expanses of North Africa. However, there was no real danger to human kind since it was possible to move settlements to other areas. In our time the strength of our influence grew so much that at the south pole the snow is polluted with DDT which comes from far continents, not to mention radioactive fallout which is absorbed on the opposite sides of the globe.

We also hear predictions of exhaustion of vital raw materials due to wasteful and uncontrolled consumption of resources which cannot be renewed such as oil and metals, and perhaps worse than all of these, our ability in the biological field in which we overcame the laws of ecological balance and we ceased to be prey for animals and pathological bacteria. This ability caused a population explosion at a rate which increases exponentially.

3. The Need for a Change of Approach

In contrast to the fast rise in the strength of human influence and the complexity of problems so derived, we remained bogged down with rigid thought patterns and an approach fragmented among different disciplines while before us were partial or short-range goals but no comprehensive grasp of the phenomena. There is no doubt that this approach further aggravated man's negative influence.

The awakening of environmental awareness came late. Suddenly we discovered there is no value to economic doctrine which ignores the finite nature of natural resources and vital influences of economic activities.

We are still in the early stages of interpreting the laws of nature upon which the continuation of the ecological systems rests. Without this knowledge - how will we be able to ensure the continuation of man's vast array of accomplishments ? We are accustomed to see man as "the height of creation" because "man was created in the image of God" . This exaggerated anthropocentrism actually severed the connection between man and nature and its laws.

In the economic sector, we see in the achievement of immediate results an expression of efficiency. All economic indicators such as the gross national product are based on obtaining short-term profit by increasing the pace of the cycle of investment and growth of consumption. Each process constitutes a self-sufficient segment, which causes a clash and harm to all concerned.

This fragmented approach places the human economy in conflict with the natural economic system in which mutual dependence among all the elements exists. For example, in modern agriculture we desire homogeneity and specialization in uniform crops across wide areas in contrast to the basic law of ecology which determines that the more diversified a system is, the more stable it is.

4. <u>The Three Pronged Task of the University: Instruction, Research and Dissemination of Knowledge</u>

There is a close reciprocal relationship between society's goals and methods of instruction and research. In order to achieve narrowly defined goals in a short time, it is necessary to separate knowledge into narrow categories and specialize in them. Even in a subject such as medicine the trend towards specialization dominates, dividing man into segments and severing him from his environment. We worked wonders in surgery and in biological engineering, yet we neglected the development of bonafide human ecology for prevention of environmental obstacles and tensions. Indeed, the increase of knowledge forces us to specialize in order to control events. However, comprehensive evidence, the possibility for integration,

and interdisciplinary synthessis are needed. Unfortunately the traditional university system is not designed to dispense broad education such as this. However, its three pronged task for the advancement of knowledge by research, training of manpower and dissemination of knowledge by means of publications and meetings imposes a heavy responsibility on the university to improve the situation.

In the field of teaching, the lack of interconnections among the disciplines which dispense the bases of natural and social sciences, law, etc., in order to train professional managers in public environmental management and management of enterprises whose activities affect environmental quality, is especially evident. Professor Lavièrée, head of the Comprehensive Planning College (The University of Tours, France) writes: "A policy intended for the improvement of environmental quality and rational utilization of its resources which ignores the need to train the men whose task is to implement it, will result in waste and failure. Training such as this is intended not only for use with new technology or new materials, but requires integration of disciplines which are functionally related , even though separated by university tradition. We must define the contents of the curriculum and the pedagogical method anew. More than in any other subject, teaching environmental science must be dynamic, future oriented, multifaceted and comprehensive; the intention is for genuine integration of the disciplines, and not just instruction of different subjects simultaneously, without an organic connection between them. As in medicine, so in environmental science, we need general experts in addition to specialists in certain aspects of the problem".

Indeed, several unversities in the United States, Canada, Sweden and France introduced comprehensive environmental curricula based on the above principles. In Israel the first signs in this direction can be seen, still modest and struggling for their place in the traditional educational system. More than from lack of means or trained personnel, we experience difficulty in developing this because of the conservatism of the institutions of higher education. As a man who deals with municipal environmental management, I am aware of the need for personnel in order to combat the complex problems of urban environmental development.

As we begin planning rational use of resources - air, water, or land - in the crowded urban region, we immediately come up against lack of professional men with broad education, not only in certain fields such as architecture, sanitary engineering or transportation, but likewise a lack of men with broad knowledge of different outlooks of city planning, in areas of engineering, sociology, economy, health, law, etc.

Even in large enterprises for manufacture of chemicals, oil, electricity, metal, cement, minerals, etc., there is a need for environmental managers that specialize in all areas in which the activities of their enterprises influence the environment. At the state level, determination of standards for preservation of environmental quality and supervision of their application requires integration of skilled mapower into all branches of the administration which are responsible for planning and execution of environmental policies.

We are not exaggerating when we say that not only the quality of life and character of future Israeli society depend on the solution to these problems, but our very existence and our ability to continue to develop and comprehend it.

There can and must be a decided contribution of the University in the areas of instruction, research and dissemination of knowledge. To that end it should demonstrate the ability to adapt to the real needs of society which are sometimes in conflict to the barriers which exist between faculties and different colleges.

If it succeeds to master the enormous scientific potential hidden within it for the good of improving environmental quality, I am convinced that we'll be able to solve the difficult problems which stand before us.

PUBLIC ENVIRONMENTAL - QUALITY EDUCATION

by
ARTHUR LIEBERMAN

Public Environmental - Quality Education in Israel

"Persons and agencies responsible for conservation efforts in a country, region, or subregion are challenged to ensure that ecological knowledge is employed in making planning decisions, or stated otherwise, that ecological capabilities are used as a guide for planning. Increasingly, the need for employing environmental considerations (as well as social and economic considerations) is being given emphasis in their contacts with governmental officials, civic organizations and interested private citizens.

The challenge lies in the ability to develop an informed public, adult and youth, (1) aware of environmental problems (2) anxious to seek solutions, and (3) ready to support public and private approaches that apply sound biological and ecological, technological and planning and design knowledge both toward the solution of existing environmental problems and the prevention and limitation of future problems.

Public Environmental Quality Educational Process

It is possible to model an idealized public environmental quality educational process that leads towards an educated, informed public. By comparing this with the stages in the educational process, one arrives at a useful device to gauge influencing the general public's perception, motivation and desires and action. The flow chart (figure 1) showing a comparison of stages in the educational process and public environmental quality educational process, identifies stage 1 as that of awareness and of identification (recognition) of environmental problems. It is the stage of exposure by the mass media of such environmental problems as air -, water -, noise -, soil -, and visual-pollution, and it is precisely at this stage that much of Israel's general public appears to be today. (In the United States, this stage of strong focus on identification of problems in lakes and along the coastlines, in air over cities and for long distances around them; the use of pesticides, herbicides, fertilizer materials and their implications for natural systems and processes, etc. came to a peak about 6-7 years ago. The end of that stage was signified (in the U.S.) by the increased clamor for positive activities on the part of an ever-wider segment of the overall population, as manifest in letters to newspapers and periodicals on environmental issues, participation in citizen's environmental management groups, heightened pressure on elected officials to act positively on environmental issues, and even voting for members of Congress and state legistlative bodies on the basis of their environmental records).

Mass media have a strong role in stage 1 to play in the creation of awareness. Often, they tend to exaggerate or sensationalize issues and leave aside important scientific information in their reporting; this is a danger with the press, television, and radio that environmentalists trying to reach the public on issues in stage 1 and thereafter should carefully avoid. But, the mass media can be a major ally in calling attention to environmental problems and one has only to note the major inputs from Haaretz, the Jerusalem Post, Maariv and other newspapers, as well as Israel Broadcasting programs, in the period from late 1971 through to the present to be cognizant of how much public attention they can draw to pressing issues, such as the concern for the Sea of Galilee.

The importance of the mass media being factual and informed cannot be overstressed; indeed, training for reporters assigned to environmental concerns may be a valuable and important step to be undertaken.

Stage 2 may be said to begin at the point of rather general recognition that the identification (recognition) of major environmental problems has occurred, and there is a discernible desire to seek solutions to these problems. This, then, is a time of motivation on the part of increasing numbers in the general public who want to see "activity" taking place to resolve the environmental difficulties. It may become a period in which use is made by zealous environmental groups of simplistic slogans that reveal a lack of information on ecological, biological, technological and planning-design principles, systems, and methods. Such sloganeering can stimulate the public to still greater desire to have people in government "do something", but they may create false notions about the means to achieve the ends.

EDUCATIONAL PROCESS

AWARENESS ——> MOTIVATION ——> ACQUISITION OF KNOWLEDGE ——>ACTION——>SATISFACTION

PUBLIC ENVIRONMENTAL QUALITY EDUCATIONAL PROCESS

Identification (recognition) of environmental problems ——> Desire to seek solutions to problems ——> Acquisition of appropriate knowledge: ——>Application of the knowledge——>Environmental Quality

1. Biological and Ecological
2. Technological
3. Planning and Design

physical-social interface

STAGE I | STAGE II | STAGE III | STAGE IV | STAGE V

COMPARISON OF STAGES IN THE EDUCATIONAL PROCESS AND PUBLIC ENVIRONMENTAL QUALITY EDUCATIONAL PROCESS

Figure I

Arthur S. Lieberman/March, 1973.

It is precisely here (at the beginning of stage 3) that the real need exists for the acquisition of necessary and appropriate knowledge by the general public, so that is can intelligently support wise environmental policies that will help to correct existing problems and prevent or considerably limit future problems. A major thrust is to present scientifically-factual materials to the public in a format and wording that is appealing, can be reasonably easily comprehended, and draws attention to potential modes of action in handling the specific problem. These materials can be made available through a variety of educational methods, utilizing selected mass-media, independent and small group study means, for maximum inpact and learning.

Comparing public (U.S., Israel) Environmental Attitudes

A comparison can be made between the stages already experienced in environmental attitudes and desires of the public in the United States and what has become evident in very recent periods in Israel, with a gap of several years perceived between the onset of the awareness stage in the general population of the former and latter countries. This would seem to indicate, if accurate, that education planning for curriculum development on University and other levels in Israel will very soon be faced with pressures for intensified emphases in such studies, in both formal curricula and in providing materials that may serve as a basis for environmental decisions on local, regional, and national issues. In saying this, one is intimately aware of the different situations, demographically and socially speaking, in Israel and the United States, but does see some important carry-over elements in trying to relate environmental education perspectives to needs, capacities, and limitations in Israel. That is to say, the general trend in Israel is from awareness of environmental problems to a desire to change and ameliorate offending situations, and this will predictably be followed by a strong need to acquire the tools (biological, technological, and planning) that will enable progres toward physical environmental quality in its various dimensions, followed by incorporation of these in policies and decisions on specific issues. Ths physical-social interface is recognized as highly important, with defense and economic needs strong factor in the total picture, but the pressures on natural resources and open space tend to increasingly place the environmental issues high on the list of priorities in Israel.

Opportunities for Public Environmental Quality Education in Israel

The opportunities for environmental education in Israel with youth and adults in both structured, formal situations and in continuing-education, informal learning experiences have been undertaken in several ways. One recognizes the efforts in Teva in the school system; the field schools of the Hevrah Le'haganat Hateva; the recent publication entitled "hasvivah bah anu Hayim", issued by the Ministry of Education and Culture in cooperation with the Reshut Shemurot Hateva and Hevrah Le'haganat Hateva (which contains a fine array of materials in brief form on topics ranging from air, water, and other pollution problems to ecology in landscape planning); and television and other mass-media focuses on environmental issues.

It is with these illustrations of constructive forces and elements that one begins to assess potentials for environmental quality education programming that addresses itself to all segments of the population, in school, in post-school situations, and for those who may not have received formal education. Particularly, as one includes the aesthetic-visual components of environmental quality does the importance of the latter category take on significance so as to make the quality of life better through environmental enhancement. The very recent activities of a Philadelphia-based group (Group for Environmental Education, Inc.) in producing a very high quality set of materials on our man-made environment come to mind as the communication to certain grade-levels of school children is considered, in this instance in highly urbanized situations.

The basic premise in environmental education is that many routes and approaches need to be explored and charted to meet needs of the diverse audiences and students, from a wide variety of backgrounds, interests, and value systems and outlooks. To provide even a modicum of these in Israel will require a concerted effort of persons in several disciplines jointly working under a coordinated leadership of competent educators who have an

understanding of the audiences, of the students, and of methodologies appropriate to reach and teach them. It seems fairly evident to me that an academic base must exist for such environmental education curricula, materials and approaches to be developed.

Categories of Subject Matter - Some Examples for the General Public

In order to equip the public with the complex subject-matter involved in the areas of physical environmental quality education, a professional advisory team from ecology, biological sciences, economics, urban and regional planning, landscape architecture, continuing education, environmental engineering, human ecology, soil science and other disciplines should be constituted. Such an advisory team, headed by a coordinator familiar with public-education approaches, would develop a national approach to educational programming in physical environmental quality for the general public.

Exhibit B provides examples of environmental fact sheets developed in the State of New Hampshire, U.S.A. for such purposes. Although scientific researchers in Israel may raise questions about specific points in the discussion on a particular category, the title of the various topics covered can serve as a guideline for Israel, namely

Water Pollution Abatement Timetable
What Can You Do, Personally, About Water Pollution?
Eutrophication
Scenery Preservation Streams and Shorelines
Wetlands A Vital Natural Resource
Tidal Wetlands of New Hampshire
The Town Conservation Commission in New Hampshire
Watershed Associations
Air Pollution
What Can You Do, Personally, About Air Pollution?
Pesticide Points
What Can You Do, Personally, About Pesticides?
A Promising Solution to the Dump Problem - The Open Pit Incinerator
What Can You Do, Personally, About Solid Wastes?

Urban and Municipal Scenery Preservation

Scenery Preservation Along New Hampshire's Highways

Population

Environmental Education in New Hampshire

(Kindergarten through Twelfth Grade)

Adult Environmental Education

Partial List of Conservation Organizations in New Hampshire

The 1899 Refuse Act - How You or Your Group Can Stop Polluters of of New Hampshire's Waters... and Make Money!!!

Environment Hot Line

Open Space

Current-Use Assessment - One Tool Now Available to Save Open Space

Easements

Zoning

Land Subdivision

Residential Housing

Vacation Home Developments

Beyond Stage 3: Action and Satisfaction

At the beginning of stage 4, the difficult decisions arise in the attempt to integrate environmental knowledge with economic and social policies. Such has been the case in environmental - economic - social "tradeoff" situations such as occurred in the case of the siting of a conventional power plant along the coastal plain, with alternatives of Nahal Tanninim or Hadera areas (1972) and the question of Nesher quarrying operations and Mount Carmel (1973). In the case of the former, it can be shown through a review of press clippings (Exhibit F) of the period of winter and spring of 1971 and 1972 that heightened public awareness had occurred and citizens were becoming stirred by a major environmental issue. Finally, an interdisciplinary planning team headed by Dr. Moshe Hill was called upon to assess the alternative possibilities and report its findings and recommendations (1). Despite the fact that such a study was confined only to the alternatives of Tanninim-Hadera and not able to explore other, possibly more environmentally-suitable approaches, it nevertheless represented a breakthrough in that resolution of a major environmental issue was put in the hands of a regional - environmental planning team from

pertinent disciplines.

One can similarly see the importance both of buildup and public pressures in the case of the Nesher quarry operations and Mount Carmel National Park in 1973 (Exhibit C, E) and the input of an interdisciplinary study in helping to arrive at a conclusion (2). The article by Dr. Ze'ev Naveh in presenting in Haaretz (Exhibit D) in easily-understood terms, the perspective of an ecologist who had shown a method for rehabilitation of an old quarry but still opposed permission to intrude on Mt. Carmel National Park, also became an element in influencing public opinion.

Evaluation of Physical Environmental Quality Efforts in Israel:

Structure, Methodologies and Techniques for Public Participation in Physical Environmental Quality Efforts

It is quite apparent that the achievement of physical environmental quality in any country is dependent upon the cooperation of the public. One notes in the U.S.A. in recent years the active participation of the public in performing inventories and helping assemble information that can be used by governmental officials and others in arriving at decisions that affect the environment. Activities will include the effort of environmental management councils which can provide a unique input that exists in comparatively few places (in fact, in the United States the use of environmental management councils has been a very recent development, but one which is gaining increasing national attention as a means of utilizing the interest and capabilities of citizens in helping to protect and enhance the environment).

Formal and informal educational efforts including many different methods are beginning to make an impact on the general public, and through the general public upon those responsible for enviornmental planning and design decision making in all its forms.

The relating to special groups and their backgrounds, traditions and value

systems is increasingly explored because it would seem to hold the key to successfully reaching the many publics that need to be reached on environmental matters.

A. Environmental Management Councils

Municipal Advisory Councils for Environmental Conservation having as their purpose, to provide guidance for establishment of local government agencies to serve as focal points for protection and improvement of the natural and man-made environment, have been encouraged in the State of New York and deserve serious consideration as a means of enlisting the aid of interested and hopefully informed citizens. A publication entitled "Municipal Advisory Councils for Environmental Conservation" was issued in September 1970 by the-then Office for Local Government of the State of New York. In the booklet may be found one of the sample local laws which contains suggested provisions for establishment of a county environmental management council. The duties in this local law reflect the inter-county and intra-county coordinating role to be filled at this level of government as contrasted with the more localized responsibilities of city, town, and village commissions.

Powers - Duties - Programs

"Environmental problems are so diverse that a newly formed commission may be perplexed as to the nature of its central substantive responsibilites within the broad framework of advising the governing body. The identification and preservation of functional open spaces in a community would be a good place to start and this is why provisions for this purpose have been stressed in these sample laws.

After an initial heavy involvement in open space preservation and management, local conservation commissions have broadened into areas where they find themselves working closely with planning and other agencies on development issues. Parks and recreation work, pesticides and chemicals control, clean-up and litter control campaigns, shade tree planting and replacement, control of visual pollution, landscaping and other types of community improvement projects, air and water pollution control projects, erosion control, utilities and highway issues,

junk car disposal and related local regulatory problems, control of surface mining and rehabilitation of mined areas, ground water and soils problems relating to percolation and development - all these and more have been subject to action by existing conservation commissions.

In Israel, the governmental structure both on the regional and local level currently varies from the specifics of the units at counterpart levels in the United States. However, the ability to realize the inputs of citizens who currently work very hard for environmental quality as members of the Society for the Protection of Nature or other groups of interested lay persons, can in part be achieved by the organization of such environmental management councils. This will enable people to operate in a recognized framework and will give them the feeling of active participation in protecting and enhancing the environment.

It is suggested that the Environmental Quality Service give careful attention to the potentials, legal framework and organization of environmental management councils, and to enviornmental education needs of such councils, should they be formed.

B. Civic and Citizens Groups and Informal Educational Efforts

In the recognition that civic and professional organizations and groups of private citizens often seek to (or can be encouraged to) become more knowledgeable and active on environmental matters, it is recommended that an up-to-date listing of such bodies be prepared and maintained, both on a national and regional basis. The names and addresses of the officers, and the possible ways in which the group could help promote physical environmental quality efforts should be included. It would also be helpful to note persons who are members of or have identified with national and international organizations outside of Israel addressing environmental concerns (such as the International Union for the Conservations of Nature, the International Federation of Landscape Architects, the American Society of Landscape Architects, the National Academy of Science (U.S.), the National Wildlife Federation (U.S.) Sierra Club (U.S.), and numerous others).

Within Israel civic and citizens groups that would conceivably be included are:

Tzofim
B'nai Akiva
B'nai Brith
Rotary
Israel Landscape Gardeners Association
Israel Association of Landscape Architects
Israel Association of Architects and Engineers
Environmental Planning Association
Malraz
Hevrah Lehaganat Hateva
Hovevei teva
The individual kibbutz movements
The moshav federations
Organizations of olim by countries of origin
Alumni organizations of colleges and universities such as Technion, Hebrew University, Tel-Aviv University

These groups could assist in the sponsorship of environmentally-oriented activities for their own group or in conjunction with others. They could be called upon to help furnish from their own membership the names of individuals with specific competencies to be used to plan and execute environmental quality promotional and educational activities.

In brief, conservation groups naturally rally around environmental issues. It is important that others be informed, be made interested and take a personal part on behalf of environmental quality in Israel. Maintenance of a good file, up-to-date and with solid details about the potential interest and input of such groups as those noted above would help to enable this personal and group participation to occur.

C. Working with Specific Groups and Their Backgrounds

Public formal and informal education efforts inevitably come down to the question of special audiences being worked with. The educator then needs to

carefully consider the "client", his needs and give attention to ethnic and traditional considerations on the one hand, and attempt to identify environmental relationships (including soils) and the character of the region in which the person lives, on the other hand.

It is quite evident that a considerable variety of backgrounds, traditions and ethnic considerations are involved as one works with Israel's citizens in environmental quality education. As an example, considerable differences are noted in attitudes towards appreciation of specific plants based upon vividness of color of the plants, potential use for spices or in religious observances (such as the use of the 4 kinds for the holiday Succoth). As one adds in the elements of country of origin, level of education, the amount of time the person has been in the country, the level of appreciation of cleanliness and of environmental conservation, it becomes evident that considerable differences not only exist but must be taken into account as Israel develops programs in physical environmental quality education.

Up until this point environmental quality education on an informal level in Israel has not reached out to as many segments of the population as could conceivably be worked with in the future. Programs specifically geared toward provision of environmental educational materials for the ethnic subgroupings withint the country is strongly encouraged. Even though the author knows of no existing data that would reveal varying attitudes towards physical environmental quality of various subgroupings, he is of the opinion that strong efforts are desirable to reach such groups by concentrating on elements that have appeal and are appreciated.

Specific Groups and Appeals to Their Interest and Sensitivities

Olim coming from countries of the Middle East, North Africa, and some countries of the Eastern Mediterranean have cultural patterns that revolve about understandings and appreciations often quite different from those of Olim from the European continent or the Western Hemisphere. They often do have a closer understanding of the climatic patterns of various regions in Israel even though all may not understand the scientific specifics in relationship

to plants, animals and natural systems. In working in the field of public environmental quality education, materials that are intended to reach such audiences should be prepared with the reader in mind and their differing backgrounds and experiences should be given careful attention in the preparation of such literature. It is possible to entirely miss reaching such an audience simply because the motivations of those ethnic subgroupings are appealed to. It is suggested that persons from these cultural backgrounds and countries of origin be included in discussions preparatory to the development of methods and materials designed to create awareness and stimulate motivation toward a better environment.

In Israel there is avery sizeable percentage of the population with traditional orientations. These include poeple with a keen interest in the natural history of the land, observances of various holidays in which certain plants, animals, and land associations appear. For such individuals, be they in the moderate-Orthodox or in traditional but non-Orthodox groupins much can be done to stimulate activities on behalf of environmental quality by going back to scriptual sources concerning Biblical plants and plants of the Mishnah. From these emphases can be developed themes dealing with different parts of the country, and history, archeology and problems in contemporary land use (environmental problems as they appear today in the same location). It is felt that such materials would be especially useful in working with persons of the Kibbutz Dati movement and in the Bnai Akiva youth groups. There are several particularly good sources of information that might be employed.

As holiday approach, specific environmental issues might be introduced that can be based upon symbols and associations of these holidays. These could very likely gain a wider identification of observant groups with environmental activities in the country.

To arrive at suggestions from the vantage point of countries of origin, consultation with leaders of organizations of Olim from various countries might be given attention as well as the consultation with federations of the various types of moshavim and kibbutzim. A particularly good reference book has appeared in English entitled "One People":

1. Hacohen, Devora and Menahem, 1969. One People, The story of the Eastern Jews. Translated by Israel I. Taslitt with an Introduction by Yogal Allon. Sabra books, Funk and Wagnalls, New York.

Appeals to Economic Considerations: Business, Industry, Agriculture

In addition to differences that appear based upon religious observances or countries of origin there are socio-economic differences having to do with one's professional orientation. In this regard the appeal of environmental issues to those in industry or business will need to be addressed not only to their concern as interested citizens but also relative to economic-environmental tradeoffs so as to enable them to understand the environmental thrust to be one that is interested in fostering the country's economic well-being along with its environmental protection and improvement. Groups such as the Chambers of Commerce, Rotary, The Associations of Manufacturers and others should have materials prepared that will help to answer questions of immediate concern to them. Lists of reference materials concerned with detailed studies of other countries concerning environmental issues as they relate to economic expansion or economic stability should be assembled and made available to members of industry and commerce. In a similar vein the economic aspects of environment as they affect the agriculturist should not be overlooked; this is to say that not only should the problems be explored but the economic implication of these problems should be addressed in working with the farming sector of Israel society.

Detailed materials should be developed for the various elements in the agricultural sector, such as citrus growers, vegetable farmers, producers of other fruit crops, poultry and meat producers, commercial flower growers and others.

One recognizes that in saying this there is the danger of creating antagonism toward environmental solutions because there are some additional costs

involved but it is at that point that the importance of emphasizing environmental quality and the tremendous long term cleanup costs of environmental pollution can be used to influence the thinking of the audience in favor of prevention of pollution.

Tourists

Tourism is a significant element in Israel. The appeal of the natural environment to visitors to the country should not be overlooked. Materials designed for tourists' understanding of Israel should include emphasis about natural history. Indeed the Ministry of Tourism should be encouraged to place additional focus on nature reserves, wild flowers, wild animals and ecological relationshops that prevail in the very diversified setting of the Holy Land. The publication on Nature Reserves in Israel which appeared in English in 1972 was an excellent example of what could be done in other publications geared to a more general type of tourist.

ECOLOGICAL RESEARCH AS A SCIENTIFIC AIM AND AS AN INTELLECTUAL OUTLET

by

Dov Por

The need for environmental research in our country is self-evident. To fullfil this need, it is necessary, however, to create a scientist who goes back to his farm, to his village, to his town, working as a teacher or in any other job and making ecological observation in his free time or as part of his work.

Academic education has recently created a special image of research work. According to this image, things which are not performed in a well-equipped lab, are not fit for research. This is why whole generations of University students have thought that the only way to attain intellectual satisfaction as biologists was to have a research career at one of the well-equipped labs. If your lot was to become a high school teacher in Dimona or Zefat, this meant scientific exile in Siberia. We, college professors are to blame for such a view of our students.

It is well understood that we cannot absorb an infinite number of researchers at University labs or in the few biological research institutes. Is that going to lead to the end of research, the end of the satisfaction one may acquire in observation, interpretation and in finding out a practical solution?

Our situation as a small and poor country is better than that of any other country of similar size. The country and its nature have as yet not been explored. Our environmental problems are different because of our special biogeographic situation. Here one can find encouragement and intellectual interaction in every kibbutz and every town.

Hopefully, ecological research, which will be performed by hundreds of ecologists in their free time, may achieve here something that will make Israeli science specially distinguished. After all, one of the central problems of ecological study, predicting and improving, is the existence of a widely spread observation network.

We have been accustomed, lately, that students (or mainly female students) who have had to quit their studies after getting the B.Sc., or who could not find a job in research even after graduate studies, become bitter teachers. As a result of this, their pupils are being fed a great deal of molecular biology, genetics and biochemistry, only because the student-teacher cares so much for these disciplines. These are the disciplines he would have liked to explore if it could - or will - only be possible....

A teacher who has left University and who has a good zoological-botanical background, with an ecological direction, can organize his pupils around environmental issues in their area, and thus improve his teaching and advance his own career in science. There is still much to do about our mountains, rivers and deserts, by close observation, getting to know the conditions and recognizing changes. A great deal of our knowledge in biology has developed by the work of village teachers, collectors and amateurs. If this was true for the 19th century, and for the period before Israel's establishment, it may also be true today.

Israel's various regions should not be waiting for delegations from Jerusalem or Tel-Aviv. The ecological problems there, should be explored by people who are living there day and night and throughout the year.

We cannot constantly educate pupils for lab research and still hope for their involvement in environmental research.

Academic education, which is open to all, has got to lead the way to intellectual activity and satisfaction for hundreds of biologists even in a small country. Therefore, there should be a revision of biology curricula in Universities and in high schools. Moreover, a professional post-academic framework should be formed, where people will be able to exchange information and where summer workshops will be held. Centres supplying field research equipment as well as centers to organize activities of ecologists from all over the country should be established.

INSTRUCTION OF LANDSCAPE ECOLOGY AS AN EDUCATIONAL AND SCIENTIFIC TOOL

by

Z. Naveh

The Nature of Landscape Ecology

According to Rillo (1), the central objective of environmental education is the creation of individuals with great motivation towards rational use of the environment in order to develop a better quality of life for everyone. The purpose of my lecture is to try to show how landscape ecology instruction can be used as an effective tool for achieving this objective.

Landscape ecology is one of the younger branches of modern ecology which deals with the mutual relations between man and his open spaces and built up areas. The task of this science is to investigate the urban-technological load which is imposed on the landscape, to determine the extent of its capacity to carry this load and try to predict its future fate while trying to find a compromise between the needs of the landscape and the needs of human society. In order to assist in achieving this goal, the landscape ecologist supplies the environmental parameters which are needed by the regional planner and the decision maker about desirable soil usage by way of ecological surveys and mapping. Among other things, he also deals with ecological research into the scientific basis of ecological management of nature preserves and recreation parks, and also with research into plant adaptation and use of biological and engineering methods for rehabilitation and care of destroyed landscapes such as quarries and mining sites, road sides, etc, by way of environmental landscape gardening (2).

By the concept "landscape" we mean a visual, functional and structural integration of the lithosphere, hydrosphere and atmosphere with the biosphere and technosphere for creation of natural, agricultural, and cultural ecosystems atop their artificial products, the "artifacts" - manmade things such as structures, roads, bridges, installations and remnant which remained from previous eras.

Therefore, the distinctiveness of landscape ecology is that it is used as link between the major bio-ecological branches of the natural and agricultural systems and the socio-ecological and technological engineering branches of the human and urban systems. In contrast to geobotanics, phytosociology and the rest of the "classical" ecological fields, it is not satisfied with investigation of natural ecosystems and their biotic elements, but includes them in a higher level of integration of the total human ecosystem according to Egler's (3) definition of "Man Plus His Total Environment". According to the hollistic approach, the entire human system in its activity as a unified whole, is more than just the sum of its physical, biological, psychosociological and technoeconomical parts, in the same fashion that a clock as an active system is more than the sum of the springs and screws of which it is composed, and a wild mob on the football field, like a bee's nest, is more than the sum of the thousands of parts which compose it.

The Instruction of Landscape Ecology is a Link Between "Two Cultures" and as a Means of Consolidating the Human Ecological Philosophy

Instruction of this subject in the high school or university gives the teacher an opportunity to demonstrate this comprehensive hollistic approach which characterizes modern ecology as put into practice in the various landscape units. These units are the smallest geographical units of the landscape in which the patterns and processes appear, that is, the changes in area and time as a result of the combination of physical-climatic, geomorphological, pedological, and hydrological elements with the biological elements such as plants, animals and man, and social, economical and cultural elements which are related to soil usage in the past and in the present with their characteristics and interrelationships to form a tangible, visual and functional reality.

This reality is available for study, examination and investigation, in the field, and for illustration and demonstration by visual means in the classroom.

By teaching this subject we contribute to the breakdown of the catastrophic artificial barriers which were established in our minds by means of textbooks and the acceptable teaching methods among the exact, technological and humanistic sciences, and natural sciences and the humanities. These barriers change more and more into a fortified wall and we become the victims of the progress of modern science which requires specialization at young age and prevents both teacher and student from any possibility of creating a comprehensive and balanced outlook between the two cultures. But furthermore, by presenting nature as it appears to us at every hill and valley, in the road which crosses them, in the residential area beyond them, and in the quarry which hews them as a dynamic system in which close interdependent relations exist between man, and not only primitive man,the hunter the shephard, the farmer, but also between the technological man "homo mechanicus", and his physical surroundings, natural and manmade as we show him and help him to find the mutual relations between the natural processes and man's action, and between man's actions in the past and these processes in the present, we put into his hands the intellectual tools for consolidation of a human ecological philosophy.

This philosophy, in my opinion, has to be used as a counterbalance to the dangerous trends which exist today in modern biology and its instruction, as it detatches man from nature and its destiny, and appoints him as the "almighty man of science and technology" who knows more amd more about the nature which we are able to take apart, to isolate and to analyze to see it under a microscope and to recognize its molecules in a spectrophotometer, but less and less about nature as it really is in its action as a whole; this nature, intact, testifies everyday against the illusion of scientific supremacy which Udall (4) defined as a "rationalization that the scientist will be able to fix everything tomorrow". That same arrogance and haughtiness, which the Greeks called "hubris", which ignores man's dependence on nature and its laws, already brought a lot of trouble to humanity and was a stumbling block in engineering and development plants in the world and also in Israel, which changed from an engineering success to an ecological, social and human failure (5). It might cause a greater catastrophe tomorrow, when the findings of "biological and genetic engineering" will be assessed

by the new generation of technocrat-scientists, the product of the biological scientific education which is not founded on the basis of moral-human values (6).

Partridge, too, in his excellent article about "The Lessons of Nature" notes the importance of meeting with nature face to face in the field and not only in the laboratory, in order to be familiar with it as an organic totallity which is not lost through an artificial dichotomy and mechanistic reduction. He maintains that "the indifference to nature is not unavoidable. It is possible that it is only a shell insensitivity which can be cracked by the force of intelligent reasoning and explanation, but more than that, by learning to be open to the convincing force of nature itself". The tracing of specimens and processes occur in the landscape and the immitations which motivate them will be able to awaken the students' curiosity no less than any laboratory lesson. But in contrast to it, it will be able to develop new values in his relationship to the environment. These values will be based not only on emotional and aesthetic wishes,but also on rational-conscious and cognitive motives which arise from the knowledge and understanding of the basic ecological laws which lay the foundation of these processes and specimens. When the organic diversity - as it appears to us in the abundant marine and continental landscape units in our country - will have not only quantitative and taxonomic meaning (if only we could get that far), but also have a structural and functional meaning - of ecological stability which is based upon complex cybernatic feedback mechanisms, it will simplify the development of a sense of responsibility for preserving this organic diversity, whose destiny is tied to ours for better or for worse.

When the students find concrete precepts of evolutionary, archeological and historical continuity which are intertwined with geomorphologic, pedologic, and hydrolic continuity as they appear, for instance, in soil plant systems in the slopes of hard and soft limestone in the mountainous Mediterranean area (8), which at times can be evaluated, then concepts such as "the biological continuity of man's evolution" and"the influence of man's actions in the past on occurrences in landscape today" will obtain a very convincing meaning. When the students themselves can collect facts, sort and analyse them, and form conclusions about the factors which

determine man's feeling of comfort and well-being and the extent of the divinity of the urban landscape which is built in their environment, the concept of "environmental quality and life quality" won't remain abstract and almost banal anymore but will be tied to their affective and cognitive debate.

Training Teachers for Instruction of Landscape Ecology

The main difficulty which I see in introducing this subject to the high schools, whether in the framework of the curriculum "Man in Nature" for junior high schools, which we are working on now in Haifa, or in the framework of a special program of environmental studies, which in my opinion should jointed with biology, geography and history, is the problem of teacher training.

From everything I have said until now, it is clear that in order to teach this subject in the classroom, a general, broad, multifaceted education is required. This unfortunately is missing in our high school, academy and university graduates, in which the education is reduced more and more into narrower fields. It will be possible to find a remedy for this plague only through a basic change in the arrangement of the studies themselves, but since the curriculum is determined in much the same way as bargaining over teaching hours among the specialists, everyone in his own area only, and we still do not have specialists for interdisciplinary studies, there is not much hope that these things will change in the near future.

Therefore, the teacher will have to prepare himself for teaching about that landscape upon which he intends to concentrate, not only in the area of his specialization, but in the broader areas which were mentioned above and a well rounded teaching crew will be able, of course, to overcome it much more efficiently. Moreover, the teacher should be aided by preparation of much background material and by literary guidance from the sources which are within his reach.

A second more serious weak point is the deficient ecological education and the lack of field orientation which are characteristic of the decisive majority of the teachers which fell victim to the unballanced biological curriculum which is characteristic of most higher educational institutions in which the emphasis is put on laboratory biology, biochemistry, molecular biology and the rest of the lower levels of organization which are lower than organisms, while almost completely neglecting the levels of organization which are higher than organisms - populations, societies and ecosystems*. Courses in geobotanics and ecology of plants and animals in the routine "classical" sense and a few superficial tours are not a substitute for this education which has to be based on the ecology of systems, their structure, their function and their cybernatic control, on the dynamics of populations and societies, principles of environmental preservation and utilization of the natural resources and which also must ensure a basic minimal knowledge of the problems of human environmental quality in the world and in Israel, familiarity with the geological, hydrological and pedological aspects and with the biotic elements which dominate the field. To the best of my knowledge ecology courses from this comprehensive approach which emphasizes the fateful problems of man in modern society, still are not given in most of the universities and academies which train teachers. From the abundance of the ecological professional literature which is published in the world - including the few, but excellent works which were done in Israel by a systematized, quantitative approach, none was translated into Hebrew yet. Also in the field schools of the Society for the Preservation of Nature, teachers and guides with modern ecological knowledge are still lacking, and only in one field school, Sde Boker, the students and teachers have an opportunity, both, to learn a systematic-

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*As an example of the one-sided approach which even permitted the curricula suggested by the Science Teaching Center one can use "Readings in Biology and Agriculture" which discusses energy in cells and molecules only without even mentioning the energy cycles of natural and agricultural ecological systems, and the critical problems of the violation of the energy calance by use of fossil fuels such as oil and petroleum in industrialized agricultural systems.

quantitative approach and to struggle with it while setting up a model of energy changes and energy flow in a desert ecosystem from data which are collected by the course participants (6 days long) in the field. Now it is also planned to broaden this approach to agricultural and human systems which are represented in the Negev.

Thus, there is an urgent need for a fundamental change and for broadening ecology instruction in institutions of higher education and paralellel to that it is necessary to insure the immediate training of the teachers by concentrated sources and by books which can bring the teacher closer to the ways of thinking and working of modern ecology in general and landscape ecology specifically. As a first step towards inter-disciplinary cooperative teaching in a selected subject of landscape ecology, geography teachers, history teachers and bible teachers dhould also be included In all these training programs, the Sde Boker school could be used as a model for a multifaceted environmental field study which assesses the fundamentals of landscape ecology at work in desert landscapes. But parallel to that, it will be necessary to develop additional programs in Mediterranean and urban landscapes.

The Method of Instruction of Landscape Ecology

There is no room here to insert details about instructional methods, but from everything said up to now it is clear that this subject is based on taking students to the field, and this "field" starts in the school yard and residences. The urban environment which has the greatest relevance to the student, and embraces the nearby open areas as much as possible, represent different types of landscapes which are typical of the area, while completing this material with the aid of slides and films about other landscapes which placed the landscapes which were studied into a broad framework and point out the principles and laws which occur in all the landscapes. Participation of the student and the "invitation to investigate" begins before going out to the field by collecting ecological,

geographic, historic, economic, social and other background data which aids in understanding the patterns and processes in the field. The field work can be performed by work groups which do a survey of the landscape units according to the directions are determined during a preparatory expedition. The opportunity is given here to translate the general and unclear concept of "Environmental quality" into actual terms of characteristics and processes which appear in the landscape. For natural landscape units, the diversity of the species and the ecological stability of the soil-plant systems, the extent of pollution of river water etc. will be used as important parameters.

For the evaluation of built-up landscapes, the emphasis will be on air pollution, noise, the extent of cleaniliness and care, and additional factors which determine, in the surveyors' opinion, man's feeling of well-being. It is possible to develop while debating and clarifying, a simple sorting method which is based on a grading scale from 1 "completely satisfying" to 5 "excellent according to everyone" and to weigh the dimensions, according to a joint decision on the relative importance of each factor in the landscape unit.

Our educational success will be measured in the final analysis, not only if we developed the awareness and understanding of the close mutual relationships between the physical, biotic and human elements which shape the landscape and determine the processes and patterns which appear in it, but also if we caused some motivation for positive involvement and student activity in environmental preservation, whether by persistant and consistant action or by active participation in cultivation and rehabilitation enterprises.

I am sure that from the students which reach these active positive stages will come citizens who accept decisions which ensure a healthier and a more pleasant environment than that in which we live today.

THE PLANS OF ESTABLISHING AN ENVIRONMENTAL CHEMISTRY DEPARTMENT AT HAIFA UNIVERSITY - "ORANIM"

by

Dr. Uri Zoller

1. Introduction

Historical Background: "Oranim" - The School of Education of the Kibbutz Movement - has a unique structure. It is the sole school in Israel which trains and prepares educators and teachers for the ages 0-18; i.e. from "metaplot* for babies up to qualified social studies and natural sciences teachers (graduated with B.A. degree) for the junior and senior high school.

In the past, "Oranim" trained only those members of the Kibbutz movement who had been sent by their own kibbutzim. Each of these people returned at the end of the study period to his own kibbutz and joined the educational system there. Today, about half of the student body consists of non-kibbutz people. Consequently, the curricula for teacher training and educators are adjusted to meet the requirements of the general educational system in Israel. However, all the study programs at "Oranim" are still influenced by the social and educational philosophy of the Kibbutz in Israel.

A few years ago an integration process between "Oranim" and Haifa University has been initiated. Today, "Oranim" is the school of Education of Haifa University. This framework includes the departments of Education, English, Literature, History, Jewish History, Biology, and Mathematics-Physics, all belong to the so-called Academic Division.

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*Those who take care of babies or children in the educational system of the Kibbutz Movement. There is no equivalent word in English.

Along with the academic recognition of the department of Biology and Math-Physics at "Oranim" by the council of higher education three years ago, it was recommended by the Ad-Hoc committee (specially nominated for this purpose , that "Oranim" should "develop a teacher training program for chemistry teachers and also create new options within the existing program".

Following this recommendation, a division of Chemical Studies was established at "Oranim". Its purpose has been to extend the chemical studies at "Oranim" by teaching basic principles of chemistry to the students of the existing departments and at the same time to create the foundation for an independent chemistry department in the future.

The plans of establishing an independent department of chemistry have reached now the point of high gear. All the efforts are aimed towards the opening of the gates of the new department in the upcoming academic year 1976/77.

Existing Constraints:

On aiming towards the establishment of a new department within a university, one has to examine thoroughly the existing constraints which dictate the frame of action.

At present, the chemical studies at high school suffer from a permanent crisis. This is particularly so as far as the non-science(so-called - "humanistic") trends are concerned. The lack of clear educational-instructional policy, of appropriate and relevant curricula and teachers, as well as the lack of interest on the side of the student body, put a question mark concerning the future of chemistry teaching in these trends. Furthermore, there are substantial difficulties in chemistry teaching also in the traditional science-oriented trends (so-called "realistic"). The reasons for this state of affairs are

many. Deliberation, however, will be avoided here, since it is beyond the scope of this article. The teaching of chemistry in the Kibbutz Movement was always on a very low level to say the least. One of the main reasons for that has been shortage of teachers with an appropriate education in chemistry who are able of handling the subject.

Taking into account the present and future conditions of the national educational system, it is desirable that the chemistry teacher training program will provide prospective teachers with a broad, flexible basis, so that following graduation the beginning chemistry teacher will be capable also of teaching additionel disciplines; i.e. biology and physics in the junior high school and probably one of these additional disciplines in grades 10-11 of high school.

Parallel to the recently well-documented process of the declining of the glory of the natural sciences in the public eyes, there appears a significant decline to occur in the chemistry teaching and its position within the curriculum of secondary education. More and more the need is felt to reestablish chemistry in its right place as an essential discipline for understanding the world around us. Understanding the fundamentals of chemistry and the chemical aspects of our world is vital for every citizen in modern society. Therefore, it is essential to emphasize in chemistry what was missing for such a long time: its relevancy to the understanding of nature and to our capacity to successfully cope with existing and future problems concerning society, environment, technology and quality of life.

If one adds to the above constraints those which are unique for "Oranim"; namely limited resources, composition of faculty, long history of biology studies emphasizing ecology and the number of potential students in the new department, - one sees that the following central question had to be answered: Is it desirable to establish an independent conventional chemistry department; or, should we establish a unique program, the purpose of which would be to achieve teaching and educational objectives <u>beyond</u> those that dictate the accepted conventional study

program of existing chemistry departments in the various universities.

Our answer is the proposal to establish an independent department of Environmental Chemistry (or Chemistry with Environmental emphasis) at "Oranim", while building the curriculum accordingly.

II. Rational of the plan to establish a chemistry department with environmental emphasis

The objective of the proposed department of environmental chemistry at "Oranim" - Haifa University is to train chemistry teachers for the intermediate and high levels of high school (junior and senior high). The curriculum was built in accordance with the prescription of new trends in chemistry instruction in the world stressing the chemistry of the environment. The environmental emphasis stems from the recognition that chemistry of the environment connects the field of chemistry with the basic problems of modern society of our time such as resources, energy, technological development, conservation of the environment and quality of life. Environmental chemistry is hence relevant to the needs of both teachers and their future students. It emphasizes the avenues by which chemistry is influencing and would influence the future world we live in as well as displays the chances and risks associated with the use of the accumulated knowledge in chemistry and related areas.

Basically, the fundamental task of chemistry teachers is to contribute their share in the education of the future citizens while the education towards the preservation of the environmental quality of life contributes a significant component of this education. An improvement in environmental education begins with the change in the character of the educator. Environmental problems are not temporary, but rather basic in our life at present and in the future as well.

The curriculum in the proposed department of environmental chemistry is aimed to develop the capacity of the prospective chemistry teacher to deal in an interdisciplinar manner with actual environmental problems

while presenting possible alternatives for solution. As such, the proposed department may become attractive to both interested teachers and their students. By means of the trained teachers in the proposed department, chemistry may attract teen-agers as an interesting and important area relevant for everybody.

It is relatively easy to apply the integrative approach in science education within the framework of environmental chemistry. Substantial lip-service is given in fostering this approach in science education, but very little is actually accomplished with this respect within the framework of high schools. In addition, the curriculum of the new department of environmental chemistry is compatible with the recent trends in modern education: These strive to implement curricula based on dealing with real actual problems derived of life and simultaneously attempt to provide the student with ways of thinking and intellectual power while directing him to search for possible solutions and concurrently developing his capacity to decide upon the desired ones. (Real problem solving and decision-making oriented curricula).

Moreoever, a curriculum in chemistry which emphasizes the environmental aspects of our life fits the character of that open-minded and intelligent teacher who is capable of using existing material and curricula and develop by himself the particular curriculum tailored according to the system of constraints of his particular school. In short, this is a program which makes the development of the curriculum-proof teacher possible; the teacher - who is capable of contributing his share in developing his students into future curriculum-proof citizens. The unique emphasis of the proposed program, may, therefore, attract potential educators who envision their profession as a destiny the purpose of which is to shape the personality of the citizen of the future.

The environmental orientation of the proposed department contributes towards its uniqueness which organically incorporates into the "history" of "Oranim". Since the establishment of the school, a special emphasis has been given to the study of both vegetation and living organisms in their natural environment. Finally, environmental chemistry meets part of the special requirements of the Kibbutz Movement and environment within the range of education and curricula.

The proposed plan - of establishing the department of environmental chemistry at "Oranim" - may contribute its modest share in the reglorification of the natural sciences as part of life, through the demonstration of the interaction between science-technology and society. Thus, based on the fundamentals of modern chemistry, the chemical aspects of central environmental problems in modern society by and large and in the Israeli society in particular will be emphasized.

III. Problems, Difficulties and Alternatives (an outline for discussion):

In establishing an environmentally oriented department of chemistry and in designing the appropriate curriculum within an existing university, one immediately encounters many problems and difficulties. At least in part, such problems may be quite similar anywhere. In addition, one has to add the particular constraints that stem from the local given framework within which the said department is to be established.

We shall present now a selection of problems and issues one has to cope with in the designing stage of such a department. The selection to be presented in an abstract form is not conclusive nor comprehensive; also, it does not pretend to suggest solutions or directives. It has to be considered as an attempt to present some of the problems we are facing at "Oranim" in the stage of preliminary planning. We hope they may serve as the stimulating basis for collective thinking and fruitful discussion. It is important to note in this connection, that we are dealing here with a department of chemistry emphasizing environmental aspects, and not with a department of environmental studies that chemistry is one of its components.

The following are some of the questions one has to think about but not necessarily in the order of their significance:

1. What are the philosophy and the educational-instructional objectives of a department of environmental chemistry aiming to train chemistry teachers for junior high school?

2. How to construct an appropriate syllabus which will meet the requirements and the scope of traditional departments of chemistry, while, at the same time will put a special emphasis on environmental chemistry? What, in fact, should the syllabus be consisted of under any condition?

3. Is it desirable to start right from the beginning to teach the basic courses from the environmental point of view, or alternatively, to start with teaching of the fundamentals and only later, on this basis (beginning from the second year on), to move gradually towards emphasizing of environmental aspects?

4. What should be the criteria for building the syllabus, taking into account the fact, that at least in the initial state, the offered options would not be many? How to ensure a minimal but rather a meaningful program?

5. How to ensure that "conventional" chemistry shall not be deprived if unconventional courses have to be introduced?

6. Should the program be geared towards teaching skills and special techniques, or should it concentrate upon comprehsneive treatment of central issues? What is the best compromise concerning this question?

7. How would courses such as "introduction to environmental sciences", "population", "resources and conservation of natural resources", "biogeochemistry", "man and his chemical environment", "technology assessment", "analysis of ecological systems" and similar courses be incorporated into the general framework of the study program?

8. How to ensure the possibility for graduates of the proposed department to continue their studies towards the second degree (contingent on their wish) within the framework of traditional chemistry departments?

We presented here only a minor portion of the questions which constitutes a challenge for serious thinking and discussion. The phrasing of part of the questions may point towards possible alternative solution. However, some of the questions call for creative thought in order to create alternatives.

What is now needed within the frame of preparations towards the establishment of the proposed department is the following: clarification, formulation and definition of the objectives; establishment of criteria and order of priorities for the construction of the syllabus; critical consideration of the existing constraints, and finally "translation" of all the thoughts and the ideas into an operational program to be accomplished as soon as possible.

SYSTEMS EDUCATION IN THE ENVIRONMENT

by

Amalia Pearlman

I. Analysis

1. The supersystem for environmental education includes basic concepts of ecology (the supersystem of nature) and basic concepts of ekistics (the supersystem of human settlements which man inserts between himself and Nature).

2. At Sde Boker, we saw how ecology was taught as problem-solving process in the field. Students made direct observations in a defined area according to scientifically selected criteria. They translated the data into charts and various conventional symbols indicating changing relationships over time etc. The principal discipline was biology, but physics, chemistry and geology played important roles. The whole study led to experimental understanding of the desert ecology and also to the discovery of better source management policy.
   In public education in the sciences, the work of Dr. Sparks and others shows how the problem-solving process approach of Sde Boker can be applied to the corner of any ordinary schoolyard.

3. Ekistics (the science of human settlements developed by Drs. Doxiadis, Mead, Fuller, Toynbee and others) can, like ecology, be taught as a problem-solving process in the field.
   Student make direct observations in a defined urban or village area according to scientifically selected criteria developed by the planning profession.
   The students translate the data into survey charts and graphs and various prediction-aiding symbols indicating changing relationshops over time etc. The principal disciplines are economics and sociology, but geography, history, anthropology and political science play important roles. It is vital to include units of study from the humanities. Tannach, art and literature (the distillation of examined human experience) illuminate the dry

statistical data with the ethical, aesthetic and psychological necessary to decision making.
In public school education in the humanities, the work of Dr. Pearlman among others, has produced grade school curriculum which teaches ekistics as problem-solving process. This can be applied in any school neighborhood.

4. Up until now, we have been teaching separate disciplines such as reading, arithmetic, science, social studies, art, music etc. and teaching them well.

Our present task is to write and use interdisciplinary units of curriculum focussed on problem-solving investigation of the total changing environment.

At the closing session of the Jerusalem Conference on Education in the Environment, headed by Dr. P. Tamir, of the De Shalit Center, a proposal was adopted to form a Center for Environmental Education as a resource for teachers. This Center, with the stipulated supportive participation of the Prime Minister's Environmental Protection Service and its staff of specialists plus environmentalists. This is the tool for producing up-dated inter-disciplinary and disciplinary units.

What units shall be designed for which disciplines and how will they be introduced into existing schools?

II. Method

How to design the units and inser them into the system for coexistence with the present establishment.

1. Taking our cue from the Integrated Studies Program pioneered in London, we begin with an integrating mechanism which already exists in our schools:

The General Assembly

All classes in all the disciplines are invited. The basic environmental problem for heuristic study is presented in all its dimensions at the General

Assembly. (It might, for example, be Noise Pollution).

The use of Community Theatre techniques is another tool which should be used for the General Assembly Presentation. A proposal to use Community Theatre in the schools of Israel has been written by Dr. Yannov and others at Bar Ilan University . Use of this tool makes it possible to present the many interacting aspects of the problem in an interesting way. This tends to achieve the total emotional and intellectual involvement needed to motivate the problem-solving investigation. (The Katamon Theatre experience in Jerusalem has shown how community theatre can promote citizenship) .

Consciousness-raising: The General Assembly has presented the problem.

What is the role of the disciplines?

2. Role of the Disciplines

In this problem-solving approach, each discipline presently taught is used as a tool for discovery in the process of collecting data and relationships bearing on possible options for the solution. Special units are written as needed by the facilities of the proposed Center for insertion into the regular school program.

For example, if the problem is Noise Pollution

Physics unit	The nature of sound. decibels, reverberation, sound suppression, muffling, baffles, barriers.
Music unit	The quality of sound. evaluation of sounds we cherish and wish to see protected .
Sociology unit	Sounds we regard as threats to health and sanity and wish to see controlled.
Political science unit	Who is responsible for what? 'carrot and stick'

	policies how to protect what we cherish, how to control what threatens us citizen, community, government legislator, administrator and public.
Economics unit	Who will pay the cost? Cost-benefit studies of various options for noise control. Primary and secondary short and long range costs and benefits to community.
Sociology unit	Social cost of negligence in terms of increased community services made necessary by noise pathology.
Tannach unit	Biblical example of the power of Sound-Jericho.
Physiology unit	Sound decibels and the human ear .
socio-economic unit	Effect of sonic boom and livestock .

As we see,all units in each discipline focus simultaneously on the problem for a given period, in preparation for the student symposium.

3. Interdisciplinary Synthesis:

The Student-led Symposium

This tool is an extension of an educational device developed under the Neta curriculum research program headed by Dr. Smilanski of Tel Aviv University's School of Education . It can be reinforced by an adaptation of the Think-Tank Methodologies developed by the Van Leer Institute .

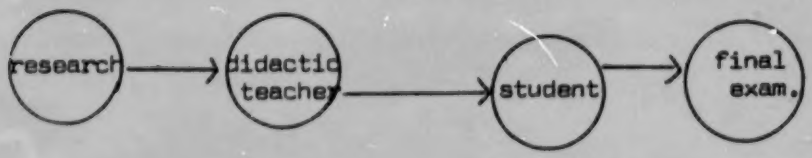
The students hold a symposium to which parents and public officials may be invited.

In this symposium, they present the evidence that has been gathered in the various disciplines with special units focussing simultaneously on the problem. (In our example, the problem was Noise Pollution). The students discuss the pros and cons of various options for solution according to the interacting evidence provided in the field by the use of each disciplinary tool.

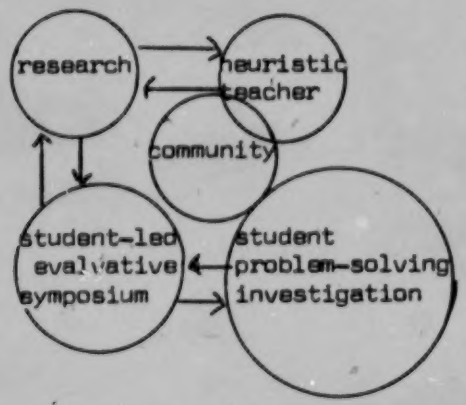
The symposium should be weighted as heavily as the final examination as an indicator of what learning has taken place.

The beauty of it is that it is not "final". In the course of such a discussion, new problems surface which then become the basis for new research and a whole new cycle of teacher-student-professional investigation is activated.

A comparison of linear learning with the Cyclic Process of Learning



linear learning: a one-way street.



Symposium

cyclic learning: a continuum. Students symposium uncovers new problems for research, triggers a new cycle of learning

4. Extension: Annual Regional Student Symposium

Students from significantly different backgrounds, such as inner city, rural kibbutz or moshav, suburb meet to exchange the findings of their local symposium. The clash of ideas stemming from variety in lifestyles sharpens the evaluative ability and affords opportunity to consider the varieties of lifestyle to be accommodated in forging regional and national policy at the larger ekistic scales.

Summary of Tools:

1. Science - applies ecology in the schoolyard (Sparks)

2. Humanities - applied ekistics in the art class (Pearlman)

3. Awareness (consciousness raising, statement of the problem in its full dimensions) general assembly community theatre (Yanoov, Miller)

4. Disciplines - focussed in integrated studies pattern and used as tools for discovery in a problem-solving process.

5. New Units of Study - written by appropriate teams in the proposed Center for Environmental Studies. (Tamir-Marinov)

6. Student-led Symposium - Neta leadership unit (Smilanski, Hernstat) Van Leer 'Thinktank' Methodologies.

5. Systems - consist of a flexible series of units which work independently and interdependently to produce a common product. In the case of environmental education, the common product is citizenship, the ability to participate intelligently in the necessary planning management of one's own time era. Existing units can be reinforced by parallel units fed into the system at any convenient time. The ultimate goal is a sequence in scope from Kindergarten through college and in every school in the villages, towns, cities and human settlements of Israel.

A SYSTEMS APPROACH TO ENVIRONMENTAL EDUCATION IN THE DESERT

by

Moshe Shachak*, Era Altman and Ted M. Kahn

It is very difficult, if not impossible, to approach the subject of Environmental Education without reference to various systems and their inherent interactions (1, and 3). Through our research at the Field Studies Center at Sde Boker over the past few years we have come to the conclusion that the desert is an optimal education tool for such a systems approach: This is because of the relative simplicity of the desert environment, which allows not only the differentiation of the various systems and their respective elements, but also awareness and understanding of their inter-relations.

The purpose of this article is to present our approach in development of a curriculum in environmental education representing the desert as an interaction between different systems, or as we prefer to call it, as a "Super System".

Concept of the Super System

The Super System, for educational purposes, is composed of the following elements (See Figure 1)

Note that the system is the lowest level of integration. As shown above, the structure, function, size and importance of the element systems (and poly-systems) within the Super System (SuS) depend upon:

(1) The surroundings, i.e., the biome in which the SuS exists;
(2) The needs and culture of Man in the SuS.

*Moshe Shachak and Era Altman head the Curriculum Development Unit of the Field Studies Center, Midrashat Sde Boker, Har Hanegev, Israel. Ted M. Kahn is a consultant for the Outdoor Biology Instructional Strategies (O.B.I.S.) Project, Lawrence Hall of Science, University of California, Berkeley, California.

We may summarize the relationships between the systems within the SuS, as well as its evolution in time, by the following "T-model". (See Figure 2).

The goals and structure of the course

A course for teachers was planned with the following three main objectives:

(1) Understanding the concepts related to the structure and function of the (Desert) Super System and its systems;
(2) Finding alternatives for man's role-function in the conservation and management of the SuS;
(3) Applying and adapting the concepts of the course to the present school curriculum.

The course was structured around a problem solving approach: What is the structure-function on the DSuS? What are the possible alternative ways of conserving it and planning its future?

Participants worked individually and in groups in order to acquaint themselves with the main concepts related to each of the systems (for the BioSocioCultural Systems, there was individual choice for areas of specialization, as this poly-system is inherently subdivided). Summary and integration was accomplished by development of a "Master plan" for the Yerocham Lake Nature Reserve. The technique used for this integration was that of a "simulation game".

The course structure is summarized in the following diagram. (See Figure 3).

The study area

The area of study, a steppe desert terrain, is situated in the Northern Negev Highlands, Israel, 50 kilometers south of Beer Sheba and about 200 kilometers

north of Eilat. This area is especially suited to our approach for two reasons:

(1) There is a large distance between the systems of the SuS;
(2) The boundaries of each system are relatively well-defined.
(See Figure 4).

Pedagogical Approaches for the Study of Individual Systems

In the study of each system, we tried to answer three main questions:

(1) What are the distinguishing elements for understanding the structure and function of the system?
(2) What are the characteristics unique to each system, which distinguish it from the other systems?
(3) What is the place-role of the system within the DSuS?

Below are summarized the concepts central to the study of each system:

A. Natural Ecosystem (NEcS)*

1) NEcS is in balance because of the interrelationship of its biotic and abiotic components.
2) Adding or removing species to-from the system will destroy the existing balance.
3) a. Different organisms have different strategies of adaptations to their surroundings; but common to all of them is the existence of a balance, over long periods of time, of

Energy absorbed = Energy emitted.

b. The existence of the same strategies decreases the species diversity and, different strategies increase the species diversity.
4) Stable systems with a large species diversity are the best ones to exploit the resources of the physical surroundings.

*Concepts of each system are not listed according to order of importance.

Summary (viz. DSuS) : NEcS, is characterised by the tendency towards increasing species diversity. A High species diversity tends to insure energy flow and recycling of elements; these processes are essential for the existence and stability of the system. The Desert NEcS is distinguished by the special relation between the driving forces: high radiation rate and low water flow. The relatively high species diversity in the desert ecosystem is due to the variety of different strategies of various organisms to adapt to these special conditions.

These concepts were studies through exercises which concentrated on the loessial plain in the desert (See Figure 4).

B. Bio-Socio-Cultural System (BioSCS)

B1. Socio-Cultural System (SCS)

(1) Different societies have different strategies for existing in the DSuS.

(2) Enlarging SCS creates a chain-reaction in the DSuS

Increasing AgS — Decreasing NEcS — Increasing ONS

(3) Different strategies used include:

(a) Nomadic culture;

(b) Ancient urban and rural cultures;

(c) Present day urban and rural culture

(4) The quality of life in the BioSCS is dependent on (due to) use of the different strategies listed above.

(5) The culture is a mediating factor between man and his environment.

(6) Surplus of radiation and deficiency of water in the desert surroundings make the production of agricultural surplus difficult. This agricultural surplus is necessary for a high standard of living in a given society. Therefore, to obtain this high standard of life in the desert (DSuS), import is necessary.

Summary (viz: DSuS): The standard of living in the BioSCS is dependent on agricultural surplus and management of the entire DSuS. In the arid

surroundings, there are special difficulties in producing agricultural surplus and management. Different cultures have different strategies in managing the DSuS.

The SCS was studied in four socio-cultural environments: Beduin (Nomadic culture); Kibbutz (collective intensive agricultural settlement); Nabatean (Ancient culture) and Industrial development towns (See Figure 4).

B2. Agricultural System (AgS)

(1) The tendancy of the AgS is to decrease species diversity.

(2) The existence of the desert agricultural system is due to a change in the ratio between the driving forces (radiation and precipitation).

(3) There exists a relationship between the NEcS and the AgS, i.e., between the main supply of water soil and organic matter:
   - The NEcS serves as a genetic pool for the AgS.
   - The NEcS is a source of disease and pests that attack (harm) the AgS.

   Expansion and development of the AgS is done at the expense of the NEcS; the AgS imports foreign elements that harm the balance of the NEcS.

(4) The BioSCS cannot exist without the AgS, excluding hunting societies.

(5) There is a strong relationship between the structure of the AgS and its productivity and the structure and function of the BioSCS.

Summary (viz. DSuS): The AgS is characterized by its tendency to decrease species diversity. Thus, the existence of the system depends upon import of energy, minerals, knowledge, technology and occasionally water. Different cultures use different strategies to change the ratio between the driving forces characteristic of the desert in order to increase agricultural productivity.

The AgS was studied in areas of grazing agriculture (Bedouin Culture), run-off water farm (an experimental farm, designed by Evenari (2), modelled after Nabatean culture) and three intensive agricultural Kibbutz settlements.

B3. Technological System (TS)

(1) The TS is presently the only system in which there is no direct use of solar radiation.

(2) The liberation of Human Energy (one of the driving forces of the TS) is a result of surplus produced by the AgS; together with fossil fuel (surplus produced by the NEcS). It is this liberation of energy, which allows the TS to grow and develop.

(3) Because of the high rate of energy use by the TS, the mineral cycling within the SuS becomes unbalanced. This result in stress on all other component systems of the SuS.

Summary (viz. SuS): The TS is in competition for space and resources with all the other component systems of the SuS. This is due to man's scientific and technological ability to increase the rate of energy flow within the TS. Thus there now exists a paradox: The TS is growing and is capable of supporting life; the other systems, which are capable of life support, are growing smaller and smaller. The only solution is the management of the whole SuS in order to reduce this competition. The Desert SuS, being undeveloped, is very sensitive to this competition; thus consideration for its management must be even greater.

B4. Conservation of Nature System (CNS)

(1) CNS = NEcS + Management

(2) The CNS has psychological, aesthetic and scientific importance for the BioSCS.

(3) The chain-reaction (described in the SCS) that was initiated by the expansion of the SCS may, in the long run, convert the NEcS into CNS.

(4) CNS is also a genetic pool for the AgS.

(5) CNS has a role in the conserving of the DSuS by increasing species diversity and by recycling of elements.

(6) To total environment.

Summary (viz. DSuS): The main thing characteristic of CNS is a strategy of conserving species diversity with human assistance (management). This strategy is very necessary in the conservation of the entire DSuS. The CNS, in combination with the NEcS, also acts as a buffer against the stress produced by the Ts, SCS and AgS. The ideas of the CNS were studied by examining the structure and function of the Yerocham Lake Nature Reserve, and suggestions for its future planning and its contribution to the DSuS (See Figure 4).

Summary - Integration of the Super System

Learning about each of the individual component systems is not sufficient, however: we were equally concerned that the student - participants in this course come away with an appreciation and understanding of the inherent interrelation between the systems and how they together compose the Super System.

Thus, a simulation game was given as the summarizing-integrating activity of the course. This simulation required the consideration of such factors as relative size and influence of the component systems in relation to the whole Super System.

A model of this simulation game - the planning of the Yerocham Lake Nature Reserve is given below: (See Figure 5).

Note that the component systems within the NEcS above - eg., CNS, TS and SCS - may expand or contract according to the feelings of the participants in the game. In this fashion, the model is extremely flexible, as participants understand that changing one element system necessarily changes the inherent structures of the entire system. Man's decisions are thus an inherent part of the structure of the Super System.

In conclusion, our main goal for this course was the understanding that Man and his environment are together one unit, not two. The course was designed so as to lead the participants to understand that the entire environment is a Super System, and that Man is an integral part of this system. Thus if we destroy a part of the Super System, men may destroy all of the Super System. Environmental education must therefore emphasize thinking and planning of how to preserve not only Nature, but the entire Super System.

LIST OF FIGURES

Fig.1: Concept of a Super System.

Fig. 2: "T-Model" of the Super System concept - showing the interaction between systems.

Fig. 3: Structure of the course "the desert as a Super System".

Fig. 4: The study area. The compartments show the sites of the systems within the Desert Super System.

Fig. 5: The main concept of the Super System as shown in the simulation game planning of the Yerocham Lake Reserve.

Abbreviations:

AgS - Agricultrual system

CNS - Conservation of Nature System.

Bio ScS - Bio socio-cultural System.

NEcS - Natural Ecosystem.

ScS - Socio-cultural System.

TS - Technological System.

DSuS - Desert Supersystem.

ACKNOWLEDGEMENTS

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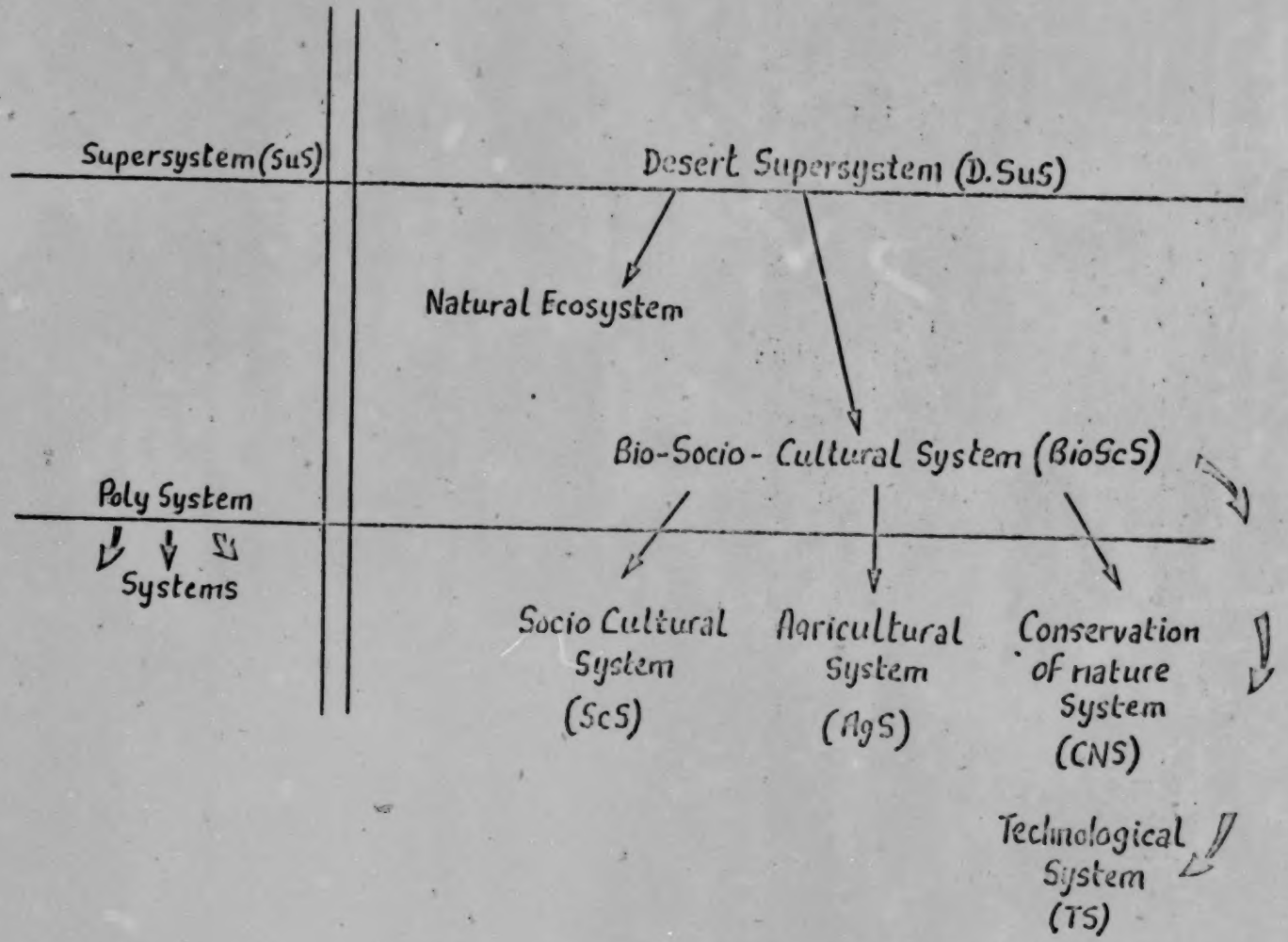
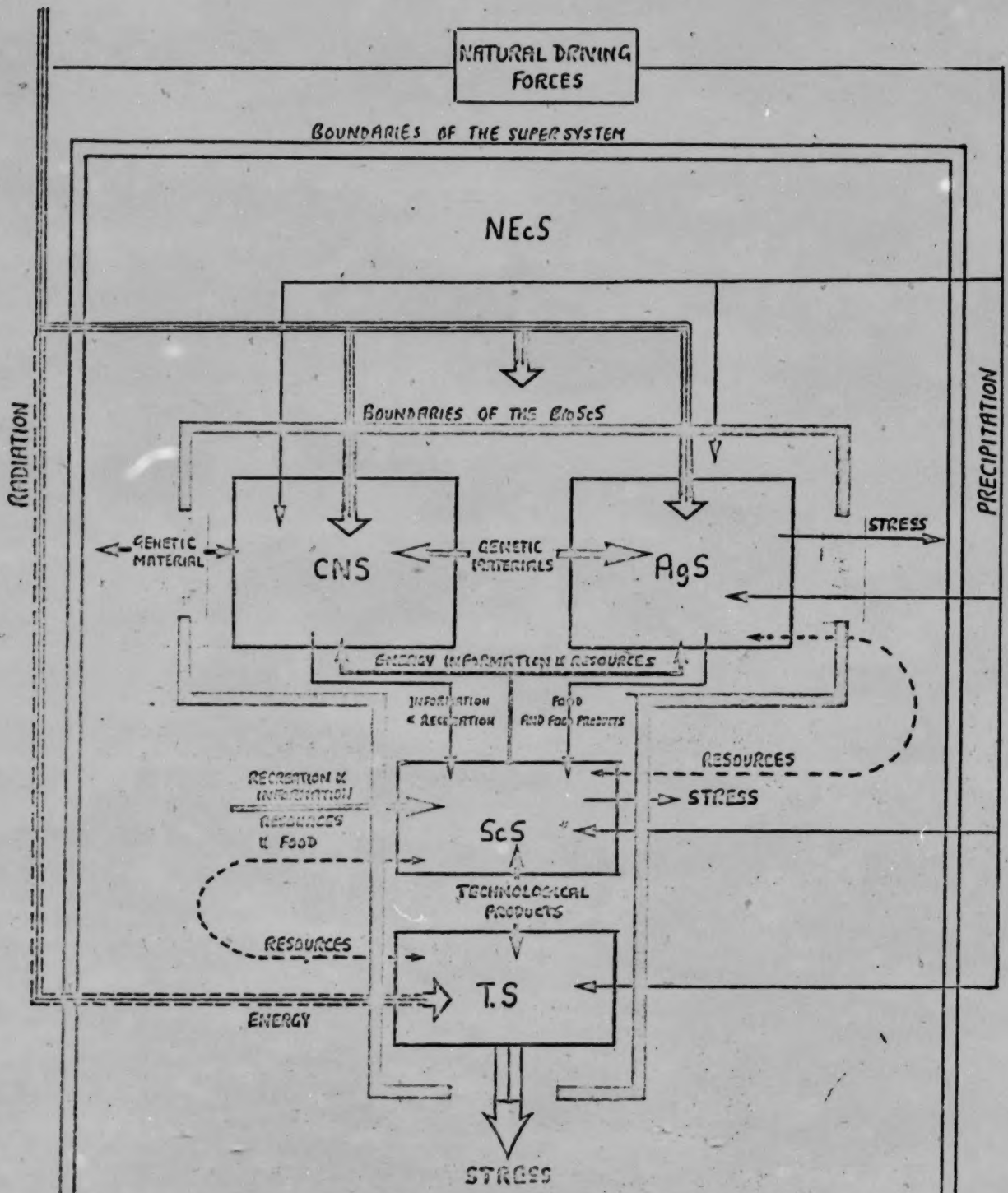
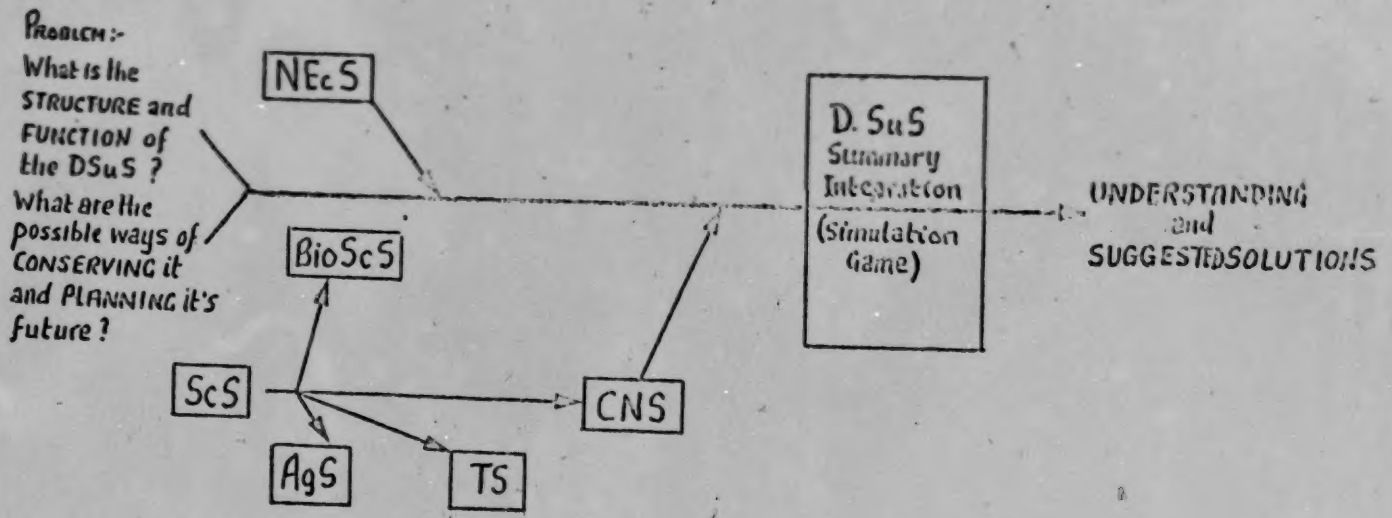
CONCEPT OF A SUPER SYSTEM

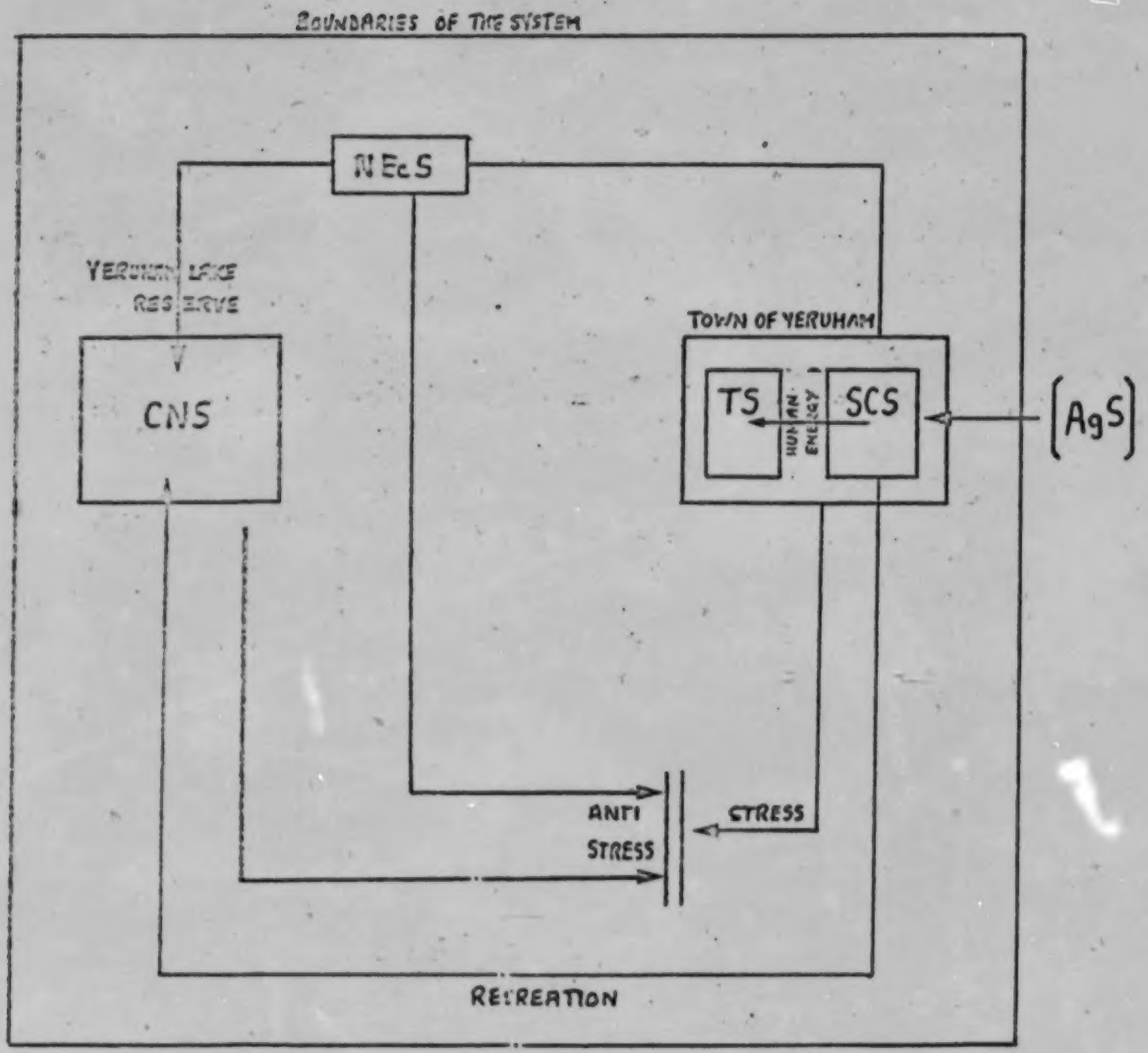


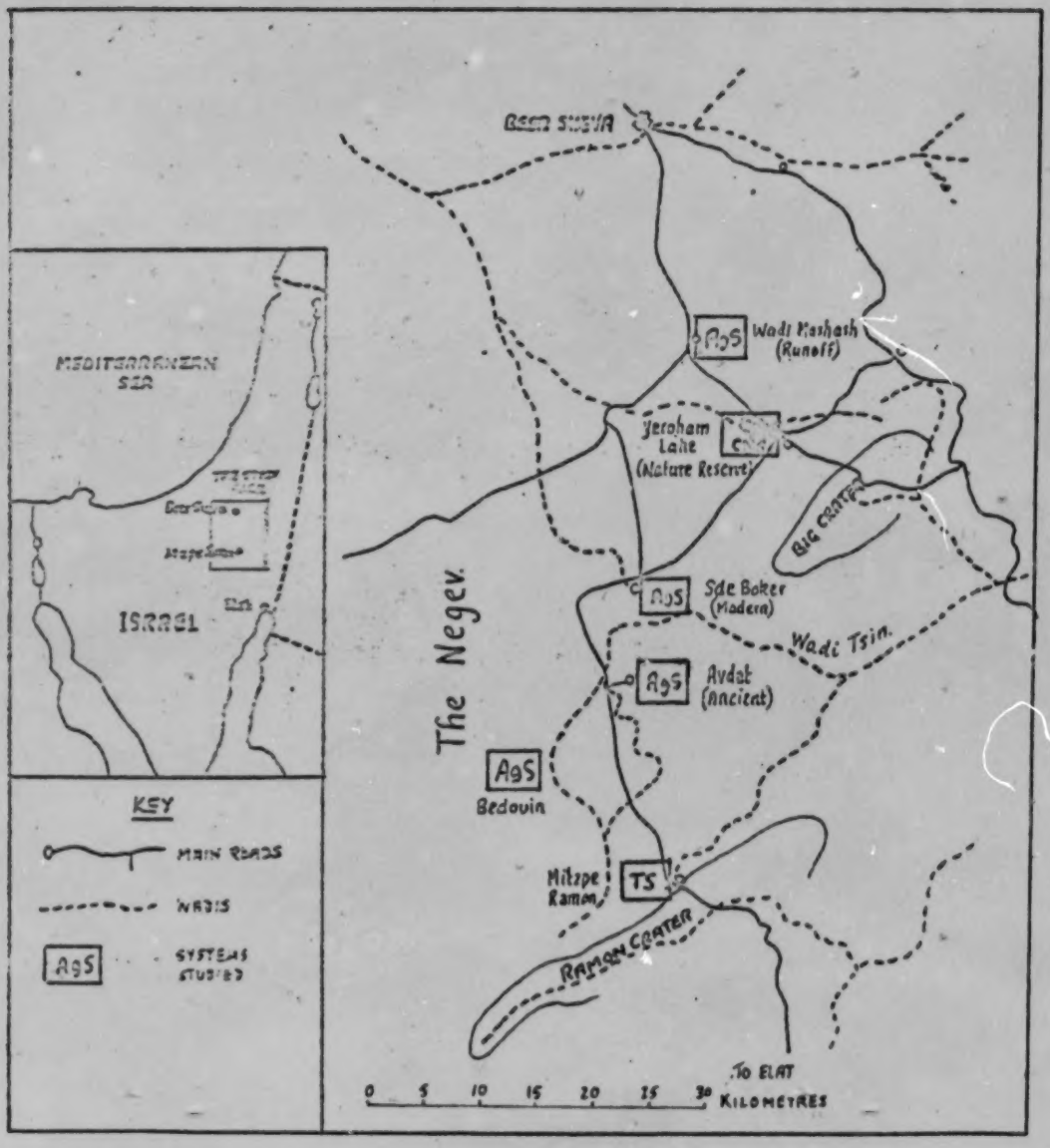

NATURAL DRIVING FORCES
BOUNDARIES OF THE SUPER SYSTEM
NEcS
RADIATION
PRECIPITATION
BOUNDARIES OF THE BioScS
GENETIC MATERIAL
CNS
GENETIC MATERIALS
AgS
STRESS
ENERGY INFORMATION & RESOURCES
INFORMATION & RECREATION
FOOD AND FOOD PRODUCTS
RESOURCES
STRESS
RECREATION & INFORMATION
RESOURCES & FOOD
ScS
TECHNOLOGICAL PRODUCTS
RESOURCES
T.S
ENERGY
STRESS

STRUCTURE OF THE COURSE "The Desert as a Super System"



PLANNING OF YERUHAM LAKE RESERVE
(within the structure of the SuS)




MEDITERRANEAN SEA
ISRAEL
KEY
MAIN ROADS
WADIS
AgS
SYSTEMS STUDIED
Beer Sheva
AgS
Wadi Mashash (Runoff)
Jeroham Lake (Nature Reserve)
Big Crater
AgS
Sde Boker (Madera)
Wadi Tsin
AgS
Avdat (Ancient)
The Negev
AgS
Bedouin
Mitzpe Ramon
TS
RAMON CRATER
To ELAT
0 5 10 15 20 25 30
KILOMETRES

ENVIRONMENTAL QUALITY IN ISRAEL

by

Uri Marinov

Foreword

The decline of environmental quality began as a result of a number of factors: the rapid growth in the number of residents, essential technological changes, growth of the large cities (urbanization) and the increase in production and consumption of energy. All these brought in its wake, an increase in the concentration of pollutants in the biosphere and as a result of that the biological balance in nature was violated.

In Israel all these factors exist and also many additional factors such as: special climatic conditions, lack of water, an overcrowded coastal region, and also special social conditions. As a result, we discern a meaningful decline in environmental quality - polluation of air, water, soil and sea, an increase in noise level and in insecticide residues in food.

What should be done?

It is necessary to define each problem well, to measure its significance, to prepare a program of action, and to decide the order of priorities. In Israel heading the order of priorities is attendance to the following subjects:

1. Water quality.
2. Physical planning.
3. Preservation of nature and the landscape; since all damange which is caused to them is irreversible.

In keeping with the economic situation, it is necessary to place emphasis on these subjects which do not require large, long-term investments and which may even be able to bring economic benefits such as: recycling (refuse, raw materials, and energy), reclamation of water, and prevention of waste.

How should it be done?

For meaningful action in the disciplines of environmental quality a number of conditions are required:

Professional and trustworthy manpower.

Suitable organization

Regard for the law

Interdisciplinary work

High level of awareness

The challenges of education and interpretation in the disciplines of environmental quality are:

Instruction of the subject

Permeation of awareness of the subject

Development of an independent discipline

Tending to the possibility for interdisciplinary work.

REUTILIZATION OF LIQUID WASTES IN AN AQUATIC SYSTEM

by

Balfour Heffer

Following is an example of finding a compromise between utilization of nature for the existence of the species, and between the different resources and the environmental aspect. The example is one of reuse of sewage, while suggesting a way to treat the subject.

There is an advantage to reutilization of waste water from the environmental point of view, (prevention of environmental obstacles), or whether with respect to reutilization of water, in light of the serious water situation in Israel.

The greatest consumption of water in Israel occurs in irrigation: since its requirements for water quality are low, irrigation is the principal user of recycled waste water.

There are sanitary and technical problems which cause difficulties in utilizing recycled water for agriculture.

1. seasonal problems: there are wastes all year. Irrigation occurs mainly in the summer. According to the research of Tahal, the quantity of waste water predicted for 1980 is 281 million cubic meters per year from which 137 million cubic meters will be available in the summer when it is needed for irrigation and 144 c.m. will be available in the winter. Accordingly, even if it would be possible to utilize the entire quantity, not all the potential is used. There are additional problems, because of which, even the avaiable quantity in the summer cannot be utilized in its entirety.
2. Salts in the water, sometimes the level of salinity of the water is too high and the water is not suitable for irrigation, such as, for example, the sewage of Haifa in which the amount of chloride is very high. It should be pointed out that this specific problem was solved by diluting the sewage in Baruch Reservoir, but in other instances no solution was found and large quantities of water are lost.

3. The quantity of sewage water required in a certain district for irrigation does not always correspond to the quantity found. In the district of Akko, for example, there are some 12 million c.m., from which only 4 million c.m. are required for irrigation. In Haifa, there are 44 million c.m. from which only some 3.4 million c.m. are required for irrigation such that inordinately high surpluses remain.
4. In spite of the many treatments, sewage contain pathogens such as bacteria and viruses and therefore irrigation with them is possible with only a portion of the crops.

One of the ways of solving the above problems is through utilization of sewage water in fish ponds together with agriculture in one integrated system.

The seasonal problem can be solved by storing water in large quantities, however, this is too expensive. In contrast, to this, if the stored water is made into a fish pond, then the fish yield for this period can solve the problem of expenses for water storage and leave a profit for the farmer. More than that, even the problem of salinity can be solved in this way since it is possible to grow fish in very high salinity, up to the salinity level of sea water. This method has additional advantages even in solving the sanitation problem of sewage water.

In the ponds there are 3 factors at work which aid in purification:

1. dilution of the sewage in the pond.
2. a long pause.
3. in a fish pond, the speed of purification is higher.

The great dilution permits a larger population of algae to develop in the pond. As a result of the photosynthesis of the algae, a great deal of oxygen is produced in the water and so a super saturated pond is obtained. This oxygen is harmful to bacteria. Likewise, following the strong assimilation, is CO_2 absorption and following that, a rise in the pH of the water (8.5-10.3).

Moreover, the actual presence of fish in the pond even helps purify the pond. In the United States research was done on this subject. In a portion of the final purification pools for sewage they placed fish, and a portion remained without fish, as a control. In checking the major parameters which measure the degree of purity in the two systems above, the following was obtained:

	raw sewage water	pond without fish	pond with fish
consumption of biological oxygen	184 ppm	21	6
floating materials	197	37	12
pH	7.3	7.9	8.3
pathogenic bacteria	3×10^6/100cc	20×10^6/100cc	2.5×10^6/100cc

Putting fish in the pool raises the concentration of oxygen and the pH in spite of the fact that the fish respire and consume oxygen.

The concentration of oxygen in the water is a function of photosynthesis and this depends on penetration of light into the pond. The more the concentration of algae goes up, the light penetration becomes less and with that also the rate of photosynthesis. On the other hand, the algae respire, consume oxygen and release CO_2. Hence the great importance of fish which eat phytoplankton. The amount of algae is small, penetration of light increases and with it the oxygen level, as a result of photosynthesis.

Even for the fish grower there is an advantage. The addition of organic material to water causes a substantial rise in the formation of natural food. The need to use supplementary food for fish (the price of which is quite high) is much less. There is food prepared naturally in the pool.

With all this, there are problems and also deficiencies in a system such as this.

The main problem is sociosanitary. It is composed of the public health problem and also the public's relationship to those fish which were grown in a pond with waste water. With regard to the purely sanitary problem, there is a need for accurate research as to whether the pathogenic bacteria multiply in the intestine of the fish, making the fish potentially active in spreading a disease, or whether the fish just carry the bacteria found in their immediate environment passively, so that the problem can be solved by transferring them to completely clean water.

Because of the inclination of public opinion and because of the importance of the problem, it is possible to take a number of important steps to reduce the seriousness of the problem.

a. to use sewage which is passed through any purification at all before use and not raw sewage.
b. about 20% of the fish grownare fry in the first phase, which in a later stage are transferred to fattening and growth ponds. If it becomes clear that fish only carry bacteria passively, it is possible to grow the fry in waste water and transfer them to clear fattening ponds later and thus, solve both the bacteriological and psychological problems.

An additional, serious problem, is the oxygen consumption of the sewage: the large amount of organic material in the sewage undergoes bacteriological breakdown which means oxygen consumption is high and this, clearly , is dangerous for fish. The solution to this problem lies in the precise calculation of the oxygen consumption of the sewage and then control of the supplementary quantities so that no damage will occur to the fry.

Another problem is that of poisons. Industrial sewage can contain different poisons, among them heavy metals. Wastes of agricultural settlements, in contrast, can contain other poisons such as insecticides of the type of DDT and more, and these, even in the most minute quantities can destroy fish. The solution to this problem is control of the source from which the wastes emmanate.

In summary, suggested here is an integrated system for reuse of effluents in agriculture. The system should be viewed as a single ecological unit with the fish used as a niche in this ecological unit. By filling the niche , the system is more balanced and more efficient and therefore good for man and the environment.

LAW AND ENVIRONMENTAL ENDUCATION

by

R. Lester

The studies at the law school are contrary to the necessary analysis of ecological problems. These studies lead the lawyer to think as an advocate, which means, considering mainly the facts which preceded the case. Thus, the lawyer always asks what happened instead of asking what will happen, though it is the latter which expresses the correct approach towards analysis of ecological problems.

Not only is the advocate's study dedicated to learning facts, but the advocate is also educated to classify issues into categories. To deal with a case, for example, he divides natural resources into categories, he breaks up water in lakes, creeks, rivers, underground-water, etc., while the problem of water pollution may influence the whole natural system known as the water cycle. Moreover, such an approach cannot cover the interactions between the creek, and the ground nearby because there are separate laws for the ground. As a result of this the treatment of environmental problems is in many hands. They are taken care of by several bodies of the government, whereas these problems should preferably be dealt by one.

In order to improve this situation, the lawyer should be led to acknowledge environmental problems. To this end, I am not recommending inservice workshops which study many subjects. I have learned from my own experience, that such workshops do not achieve their aim. It is better to direct the advocate towards ecological problems while he is still at the law school, and before he has begun studying or working on these problems.

FIELD TRIPS

TOUR THROUGH LANDSCAPE

Part of the project "Man and Landscape" in the curriculum for high school.

by

Carmella Ben-Zur

The "tour through landscape" is an integral part of the project "Man and Landscape" and is meant to conclude this project by finding and feeling practically the factors of interrelations between man and landscape which surrounds him. The tour is meant to arouse in students emotional and aesthetic attitudes towards landscapes and its components, and to the ecological influences deriving from them. To be aware of nature landscape as a factor of calming and frustration. To learn to distinguish between its physical formations, colours, smells, sound and whispers and to increase the ability of being impressed by it. To develop awareness of the influences of man on landscapes for good and for bad, for improvement and destruction. To be aware of the micro-climactic influences on the physiological feelings of man and the ability of man to change these factors, here too for good and for bad, and hence to change the physiological feelings of man, based on it, as well as his emotional feelings. To develop the ability of finding ties between events and conditions of landscape. To understand the physical and biotic factors which influence the location of man in landscape.

Maybe, that at first sight, the targets mentioned seem to be too many and too complicated. A closer look, however, will show us that in fact they are joined and interwined and cannot be separated. They are as links in a chain - joined together and interacting with each other.

The students have already learned about ecosystems and are supposed to know that every ecological system is a combination of joined and interacting units. The tour can and should be used to emphasize things they have learned and make them be aware of them.

In order to reach the objectives mentioned above, we have to teach the students skills which will enable them to make surveys, to collect physical and biotic data, to analyse them in order to clarify and understand the interactions between the physical and biotic factors and among the biotic factors themselves - including man. To develop observation skills, classification skill, the skill of listening to the finest and most delicate sounds and voices; in extreme: the skill to listen even to silence; the skill of formulating hypotheses concerning man's activity in landscape.

The choice of the route for the tour in landscape:

In choosing the route for the tour, everything must be done not to make it too long, yet to be varied enough to find answers to problems we raise and which may help us to reach our objectives. So it should have sections where man's influence is as small as possible, on the environment in which he lives. It should have sections in which the original landscape has been "ruined" by man through building houses, roads, etc., and includes all, or most, negative consequences of man's presence. And, of course, sections of landscapes "improved" by man, either by reconstruction by means of improving road sides, reconstructing plantings, adding plantings in fallow land etc. We succeeded to find a route for the tour with the three kinds of sections, described above, in Nahal Lotem on the Carmel. In addition, an observation point over most of the route was identified. No doubt, that according to the criteria, we have decided upon, we can find routes for tours in all the regions of the country.

The work has been planned so, that all the students concentrate at the beginning on the observation point and get a general impression of the view. They are asked to define their impression as: boring, calming, beautiful, sad, urban, natural, etc. They are given a blank map which later on is guiding them on their tour. With the help of the map and a compass they determine the sections they will pass. They record the built sections, the"natural" and the improved ones, according to their impression before

they have examined it directly. Finishing their tour they will return to the observation point and check their first hypotheses. The students are given a plant key which includes 15 kinds of trees, 15 kinds of shrubs and 8 kinds of climbers they meet along the route.

The origin of the plants is listed in the key. The key has two functions: a.. to enable the students to distinguish between the natural vegetation of the area and that one added by man (the positive influence of man on landscape), b. to develop observation skill. All the students go along the whole route, including all the sections, to get a general impression of it. But after the observation point, the class is divided into small groups scattered along the route and each group has to collect its data. We identified the various sections as "stations". Each "station" is occupied by 2-3 groups of 3-4 students each. On our route we have three stations, that means that you can work on such a tour with a class of 30-40 students. For collecting the data, the students are given the necessary equipment (to each group): pegs and rope to sample plots and count the perrenial vegetation, frames to count annual vegetation, earth thermometers, psychrometers which will serve as regular thermometers (students are given tables to find the relative humidity), photometers, compasses. If possible taperecorder and camera, as well as cans and bags for collecting living material and samples are used.

The tasks demanded from the students are collecting physical and biotic data. It is difficult to give the student tasks which may express their feelings. But it is certainly possible to instruct them that when coming to an observation point, they first sit down, close their eyes and try to listen to sounds, to absorb smells and describe in few words their impressions and feelings. The students are given work sheets which guide them in collecting data, evaluating them and coming to conclusions.

The tour is completed with a discussion. According to the time the teacher has at his disposal, the conversation may take place, either immediately after the tour or in the following lesson in the classroom. The short experience we have had showed us that mostly the conversation takes place in the classroom. Representatives of groups inform the class

of their findings, compare them with other groups of the same station and of other stations. The representatives of the groups tell about their physiological reactions ("it was very hot", "we looked for shade ", or on the other hand "we felt wonderful", "it was cool and a pity to leave the spot"), about their emotional feelings ("we felt nothing special, it was just hot and we wanted to leave" and on the contrary" we felt like being in another world, we heard only the trees and the birds twittering, pity we could not stay there longer"). Delivering the reports by the groups will lead the class to find the connection between the physical and biotic data and their influence on man.

OBSERVING ANIMALS AT THE ZOO

by

Yechiel Mador-Haim

The workshop was given as part of the subject "Man and the Environment" for ninth grade biology students.

Man's influence on natural animal populations is well-known. Most big mammals are gradually disappearing. This is one of the prominent results of man's direct influence on the environment. Although natural reserves have been established all over the world, that is still a very severe problem.

Teachers are thinking about how they could explain ecological phenomena resulting from the relationship between man and the animals. In this workshop we have tried suggesting to the teachers a field-trip based on observing animals at the Biblical Zoo. As we have tried arranging a direct observation of animals, we have chosen several species which can be found in nature today, or which lived in Israel once and are now extinct.

Questionnaires and guide-sheets were distributed to aid the observer. The teachers were helped by booklets of animal drawings as well. The booklets which feature animals found in Israel, are by V. Ferguson.

The purpose of the observations was to get to know well several kinds of animals, to read about their biological and ecological background, and to answer questions which deal with ecological problems, from the point of view of the relationships between man and animals.

Preparatory Instructions for the Field-Trip

The Zoo field-trip will take place after the class has got enough preparation while studying the subject of "Man and the Environment". This topic will provide background to the next topic: the environment's components. The pupils will also have to grasp some basic concepts of ecology. The pupils will work on the questionnaires in class, so that they understand the questions and practice the technique. It is important to use reading material which will help in the observations, such as: Zoological Lexicon, by M. Dor; Zoology, Part II, by Y. Margolyn; A Guide for Mammals of Our Country, by V. Fersugon; A Guide for Birds of Our Country, by V. Ferguson.

Instructions for Carrying out the Field-Trip and the Observations

The teacher or the local guide will explain how to approach observations of caged animals so that their behaviour will remain as natural as possible. It is advisable that the guide conduct a general preparatory field-trip in order to get some impressions of the various parts of the zoo.

The class will be divided into groups or pairs for work and observations. Each pair will select, with the teacher's help, the animals which it will observe. The information sheets distributed, the map of the zoo and the literature mentioned above will be useful. The signs next to each cage can be useful as well.

What Kind of Questions?

Most questions were general in order for them to suit all animals. For example:

1. In what way are the animals' limbs suited to its natural habitat?
2. How does the animal protect itself from natural enemies?
3. Could you point out any changes in the population which are a result man's interference?
4. Can destroying of a population be harmful to man directly or indirectly?

Summary of the Exercise

A general table which introduces the animals of the zoo was distributed. The table was filled-in by most observers, even though there were difficulties in describing the animals.

Since there was not enough time, participants could not get a suitable preparation in the subject. The fact they were unprepared to use the guides and books cause difficulties in filling-in the questionnaires.

All the participants agreed that this strategy of observing animals at the zoo is appropriate and beneficial. They also asserted that better observations of a small number of animals will be achieved after a general field trip throughout the zoo.

It seems to me that a general questionnaire and filling-in a table make the exercise difficult for the observant and do not fullfil the aim of "arousing the pupils' curiosity". We have learned that in order for the pupils to understand what they have to do, it is very important to prepare for the field trip and to discuss the questions in class beforehand.

We have learned that it is useful to present the pupils with a preceding description of the natural environment of each animal (pictures and written mateiral), so that they'll be able to understand the reasons for natural phenomena which are not revealed at the zoo.

Perhaps the use of specific questionnaires on several typical animals will be more suitable than a general questionnaire. See, for example, a questionnaire relating to the rabbit, which follows:

A Questionnaire on the Rabbit

Observe from a distance of about 10 meters and approach carefully. Stop when you notice signs of suspicion or when the rabbits run away.

a) Notice the shape of the body while it is active, which looks like a ball..... Why? _____

_____

Does its body colour have any clear function?

_____

b) Compare to its pose when it is not frightened but lying relaxed. Can you see any connection between its tense standing and its ways to protect itself? _____

c) How are the legs built and to what ways of movement are they adapted? _____

_____

Can long nails be a hindrance? Explain _____

_____

advantage of such nails _____

_____

d) Describe the characteristics of the various organs, such as the ears and the tail. Explain how they are adapted to the rabbit's environment _____

e) Look at the picture of the rabbit's natural environment. What types of food can it find in such an environment? How is its body's structure adapted to hunting for food? _____

f) How does it protect itself from its natural enemies, such as birds of prey or the wild-cat? _____

g) Rabbits are known to be social creatures. Suggest examples for advantages and disadvantages of social life? _____

h) Try to explain the statement taken from the Bible which says: "Rabbits are not a big people and they have come to live in the rocks". What can we learn from this statement about the rabbits? Why was the rabbit chosen for this description? _____

i) Go to the rabbits' cage and describe the distinct differences between the sexes regarding their outside appearance, their behaviour and their way of life _____

j) Try to think whether Man harms the rabbits' population, and if so how? _____

k) Can you describe the food web in which the rabbit is integrated? _____

WHAT'S HIDDEN IN OUR IMMEDIATE ENVIRONMENT

by

Ami Bernstein

Urban youth lives in a most artificial environment. He goes out to a natural environment only infrequently, and even then his contact with nature is usually through the window of a car or bus.

Does this disassociation from nature have any negative effects upon the emotional-social development of youth?

Does an inclination or yearning for contact with "Natural Surroundings" exist for youth? What is its origin? How is it expressed?

Should such an inclination be fostered? To what end? How?

It is possible to find wild life within the big cities? If so, then perhaps we can produce a daily link between youth and nature.

The principal goal of this workshop is to seek nature in the crowded urban environment and to clarify means for bringing youth closer to it.

ACCELERATED OXIDATION POOL - PLANT FOR PURIFICATION OF SEWAGE AND FOR PRODUCTION OF ALGAL PROTEIN

by

Dr. Inca Dor

An accelerated oxidation pool is a combined experimental network which is intended for the purification of sewage effluent and for the production of vegetable protein from algae. This plant is built from a series of canals in which raw sewage effluent swirls. In the effluent, bacteria develop naturally, which break down organic material, and the algae utilize the bacterial breakdown products for their growth.

The pool is shallow and exposed to the radiation of the sun so that the algae enjoy plenty of light which they need for photosynthesis. The oxygen which is released following the activity of the algae hastens the growth of the aerobic bacteria. At the end of the period of combined bacterial and algal activity, the organic waste breaks down, and, in the purified sewage effluent, a suspension of unicellular algae which is rich in protein remains.

In order to complete the purification process, it is necessary to separate the algae from the water. The algae which are extracted contain about 60% protein. They can be used for feeding animals or for production of pure protein in an industrial process.

An oxidation pool constitutes an artificial aquatic habitat which excells in very high concentrations of biotic materials and a high rate of physiological processes. Vigorous photosynthesis causes oxygen to accumulate beyond saturation during the daylight hours, a lack of carbon dioxide, and a marked increase in pH, whereas respiration causes a lack of oxygen at night in the absence of photosynthesis, an accumulation of carbon dioxide and a drop in pH. The strong daily fluctuations of environmental conditions suggests that this is a sufficiently extreme habitat and accordingly the number of types of algae and animals able to exist in these conditions is small.

The above described network is experimental and is in the process of extensive research in Israel and abroad. The foci of research are: mutualism, between algae and bacteria, the factors which limit growth of these microorganisms in the oxidation pool, ways of operating the pool and ways of separating the algae. In parallel, the nutritional value of the separated algae and their influence upon the growth of animals was researched.

WORKSHOPS

AESTHETIC ASPECTS OF ENVIRONMENTAL EDUCATION

by

Joseph H. Schwarcz

A. At the beginning of the session, the participants of the group were given the following working paper:

1. It is assumed that the potentially favourable and spontaneous relationship of a person to the environment in which he lives is conditioned, among other things, by the existence of aesthetic elements in that environment.

   In the present context, the aesthetic will be defined as the realm of phenomena that are not, or not exclusively, functional. The existence of these phenomena is justified in that they make the apprehension of beauty and significance possible through sensory perception. Thus they make available a perspective on reality from a certain distance.

   The need to infuse everyday life with aesthetic phenomena is apparently one of man's basic needs. The scientific investigation of this hypothesis has made some progress in recent years.

   The desire to incorporate aesthetic elements in the shaping of the environment is found in ever verying forms among individuals and groups in every culture, religion, nation, and class. The way in which the individual and the group relate to aesthetic aspects in the environment depends, therefore, on comprehensive cultural and social factors.

2. The present social climate of Israel is none too favourable to aesthetic design in the environment. Two surprising states require explanation: the sheer physical environment neglect; and the lack of public awareness of the problem.

   If it is true that the aesthetic environment is truly a vital human need,

how does a particular society passively accept such a low standard of cultivation of environmental aesthetics?

The answers usually suggested are highly pragmatic: The permanent state of tension consumes both energy and money; the economic development proceeds at a pace that overwhelms all other considerations; this in turn emphasizes material success, and directs people's efforts towards getting ahead above all. It seems to us that all these are partial explanations, and that our society's actual lack of interest in aesthetic values in the public sphere derives from rather more comprehensive processes.

Israeli society at this stage of its development is, consciously or not, contending with several basic challenging issues which have implications for the subject under discussion:

The essentially verbal character of Jewish culture and its future development in a predominantly visual age ~~create~~ conflicting issues.

Continuing waves of immigrants bring with them their own particular and deep-rooted approaches to the aesthetic aspects of the public domain, thus preventing the formation of a binding national canon. The process of constant immigration bears many and, at times, polar implications.

Zionist education has for ~~decades necessarily emphasized~~ encompassing social and national values rather than civic values that stem from attachment to the immediate environment. Kibbutz education is the exception as to the latter.

Paradoxically, democratic regimes are not always successful in cultivating civic pride in the public sphere, an objective with which totalitarian regimes, whose foremost aim is self-enhancement of the elite, often do succeed,

3. Education twoards appreciation of aesthetic elements of the environment, in other words, aid in internalizing the need to experience aesthetic phenomena as a part of life experience, can easily make use of curriculum contents at every stage of schooling, and in most disciplines.

   It seems, however, obvious to us that curricular material will be used to real advantage, and that aesthetic environmental education will gain much, if the following changes take place:

   The Israeli school has to be transformed into an aesthetically attractive site. School is a decisive environment in the students' personal experience. Today most of our schools - with a number of exceptions - are anti-aesthetic places. We shall be able to find ways for change when we succeed in creating an awareness of the problem.

   The Israeli school system has to provide more aesthetic processes for its students. The aesthetic, as noted above, may be defined as the non-pragmatic; our school today is an institution that puts too much emphasis on utilitarian and competitive aspects of its work.

B. When the participants were familiar with the text, slides were projected showing sites where various efforts have been made to improve the aesthetic appearance of the school.

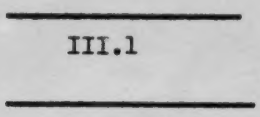
The examples shown do not refer to decoration, to external prettyfying. In these schools the attempt was made to devise a school setting with an aesthetic character, creating a distinct individuality, providing focal points of interest, radiating an atmosphere of well-being. The few slides represent a wide range of approaches: the stable and the changeable, the ornate and the simple, the use of plants and of interior design, the ideas of the professional and those of a child. A variety of interesting ways to cultivate an aesthetic environment is demonstrated.

There may certainly be differences of opinion as to the good taste of the solutions presented by these pictures. Their importance lies, however, in the fact that they exemplify a few guiding principles for turning a school into a more attractive environment.

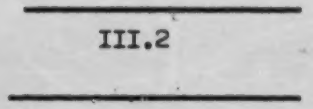
Given the general unsatisfactory state, the few scattered attempts to create aesthetic facts that radiate an educational influence bear no little significance.

a) The Leo Baeck High School in Haifa
Illustrations 1 and 2.

The school building is an unusual architectural achievement. In its centre, a large hall extends to the height of the building. Variety in the treatment of the starcases and the walls creates an interesting and almost monumental space. Lingering in the hall and walking through it may arouse a kinesthetic experience. On the other hand, corners with small-scale exhibits and benches to sit on make intimacy possible in the large space.



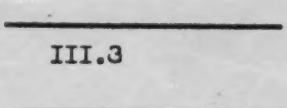
III.1



III.2

b) The Vocational School for Child Care, Kiryath Bialik
Illustrations 3, 4 and 5

In this building which includes both classrooms and a dormitory, an unconventional aesthetic effect is achieved by the use of a simple element: a wide interior staircase connects the two floors and creates a sense of space. For ceremonies and art programmes the staircase, together with the hall, turns into a tiny amphitheatre. A lawn with heavy wooden furniture extends behind the hall and adds depth.



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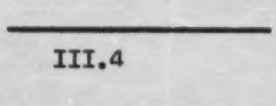

III.4

III.5

c) The Hugim High School in Haifa
Illustrations 6, 7 and 8

Guided and aided by the school's art teacher the students decorated front or rear walls in their classrooms. In this way, the cold neutrality of the classroom is overcome. In summers the walls are whitewashed and may be painted again the coming year.

III.6

III.7

III.8

d) The Ben-Zvi Elementary School in Shlomi
Illustrations 9, 10, 11, and 12

The school aims at creating satisfying surroundings in various ways. The facades of the buildings, the courtyard and the school cafeteria are designed by professionals or by the children. A small wood was planted in memory of the eleven sportsmen killed at Munich; wooden tables and benches serve for preparing homework. In another corner stands the memorial for the men from Shlomi who fell in the wars.

III.9

III.10

III.11

III.12

Photographs: Peter Silberstein.

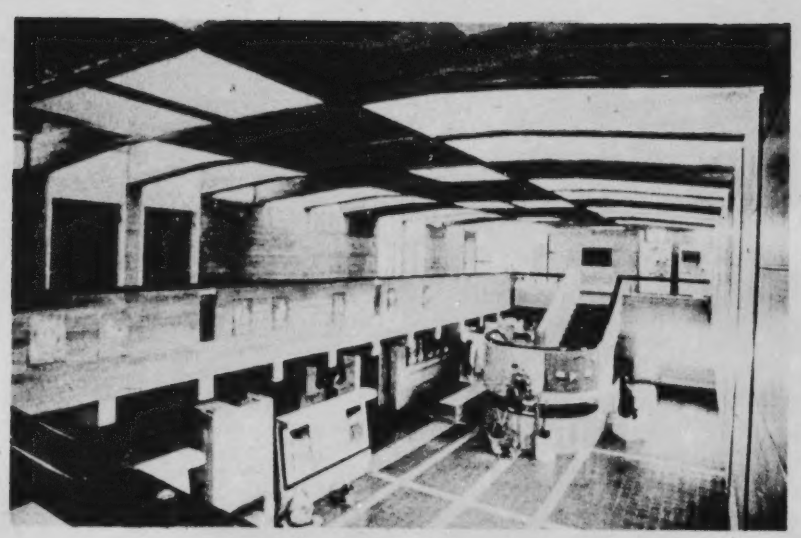

Fig. 1

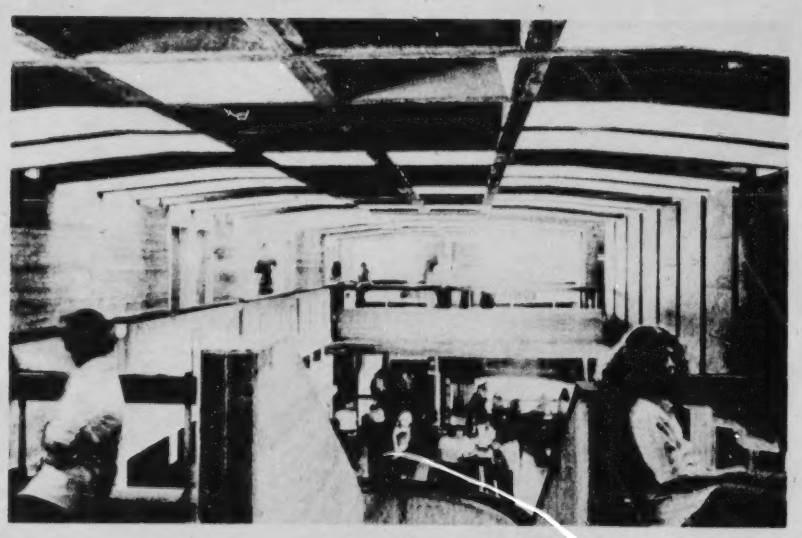

Fig. 2

Fig. 3

Fig. 4

Fig. 5

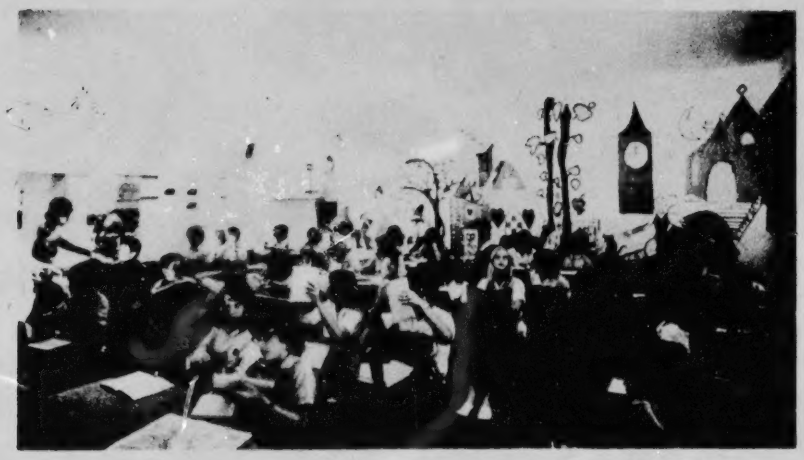

Fig. 6

Fig. 7

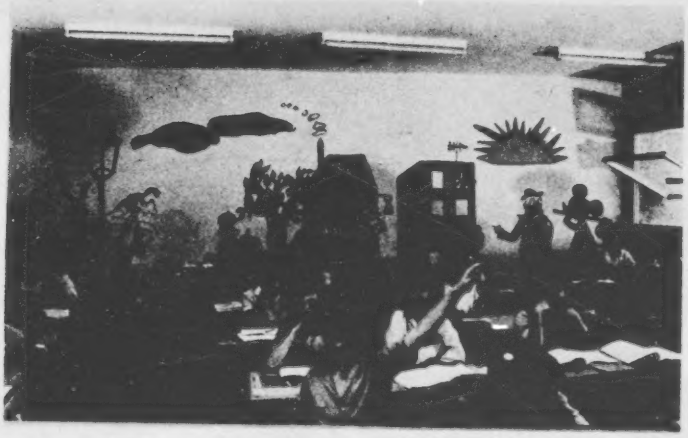

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

C. Summary of the group's deliberations

The discussion focused on several issues of theoretical and practical import.

One of the subjects discussed was the transformation of an educational institution into a place where it is pleasant to do things in, because of its aesthetic quality. Such a quality may be created by combinding elements of diverse kinds: natural assets (views, plants), architecture, art, craft-work - both stable and modular. This represents a conception that views strict functionalism as a hindrance to education.

This topic should not be confused with two related ones: decoration of the school by presenting study material attractively, by the use of audio-visual aids, etc. - taking students to the country, to museums, to attractive parts of the city.

These activities are most important and it is possible and desirable to combine them with the activities relevant to the topic discussed here, but they are not identical with it. These differences are not always recognized by teachers.

This creates some danger that in stressing these two kinds of activity we avoid coming to grips with the true problem, namely, public awareness of the basic norms for the work of school as a social institution that has humanistic functions.

The discussion detailed and stressed the substantial difficulties facing aesthetic education, difficulties whose source is the historico-cultural backgrcund of Israeli society.

It is not simple to effect the shift from the yearning for an idealized spiritual homeland that developed throughout generations of impermanent settlement in the Diaspora, to a renewed affiliation with a national physical life-space. This change has to take a long time.

The individual's attitudes to specifically aesthetic elements in the public domain and to the public domain as an area of social cooperation, as influenced by his cultural and geographical origins. Differences can be discerned in the ways parents, children and educators approach education and the role of the school setting.

In this connection it was again stressed that Judaism is fundamentally a culture whose essence is expressed in the significance of the world evolving in time sequences; that is, in categories more abstract than those of the spatial and the visual world, whose impact has increased recently.

Aesthetics and art activities in school often meet with violence and intentional destruction. This weakens the tendency to devote time, thought and means to this field, and epitomizes the frustration awaiting anyone seriously interested in changing the shape of schools.

There is no easy solution to this problem. Violence and aggression exist in society and we cannot hope to overcome them in any single area of social life.

The question is, however, more comprehensive and directly connected with the role of aesthetic phenomena in life. Their functional nature makes them less structured and thus less tolerable for a person who is inclined to violence. Moreover, a person's inclination to violence reflects the frustration that derives from psychic energy turned to aggression because education has failed to supply encounters with the aesthetic. Aesthetic experience can in part help sublimate instinctual impulse and transmute them into humanistic attitudes.

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MAN'S ATTITUDES TOWARDS THE ENVIRONMENT -
A Discussion of Attitudes and Behaviours in Environmental Education

by

Shoshana Carmel

The suggested activity for educationists consists of eight written presentations (reports or stories). Each of the passages deals with an environmental topic and is accompanied by an invitation to the reader to write down his own thought after reading. Later the individual reactions will be discussed in a small group (3-4 members) and finally the main points will be presented to the whole group (about twenty participants). As an outcome of the discussion an effort will be made to construct a list of attitudes and behaviours related to the environment. The activity was regarded as challenging by educators and others who were engaged in it. Izhar's views (1) on this issue were summarized as follows:

"Everybody is talking about values without knowing about what he is talking. There is no sense in trying to teach for values, since it is impossible to achieve anything worthwhile. This has been expressed by the author (of the essay) as follows: There is no need to educate towards values, and also it is impossible to do so". (2).

Values may be regarded as a whole system of social norms, judgements and decision-making. They will be meaningless, if there is no personal commitment to behave according to them, and also to be responsible for the outcomes of one's behaviour. Because of the demand for personal involvement, values will not be fixed for ever, and therefore they should not be regarded as 'aggregates of stones', as one of the Israeli writers put it (3).

Discussing environmental education we should assume, that man causes changes and that he is expected to be responsible for the changes caused by himself. Environmental education should therefore aim at fostering the responsibility of man while acting in his environment.

"The purpose of environmental education is to develop citizenry which is knowledgeable concerning the biophysical environment and its associated problems, is aware of how to help resolve these problems, and is motivated to do so." (4). To create the motivation for being engaged in environmental problems and also to be aware of the possible outcomes, will be the responsibility of educators. We should concentrate on developing open-minded attitudes of social responsibility rather than 'preaching' what these attitudes should be. If we really want to avoid preaching or indoctrination, we have to start with finding out what kind of attitudes and values are accepted by our students. Only if we know their own criteria for decision-making in environmental issues, we shall be able to develop a worthwhile environmental education. With these considerations in mind written passages are given to a discussion-group of educators. Each of the passages concentrates on an environmental problem and is accompanied by a printed invitation to the reader, to write down his first, second, and if possible his third thought, after reconsidering the two previous ones. In a group discussion following reading and writing down one's thoughts, the individual reactions are presented to the participants. Later the group will be engaged in ordering and formulating the attitudes and behaviours inherent in their own reactions. The activity has been found to be effective in fostering the willingness of educators to analyze the reactions and behaviours of their own students. Later on presumably these educators will try to define desirable attitudes and behaviours which should be developed in environmental education.

Choosing the reading material.

The case-studies and stories have been chosen with the intention of conveying a brief message concerning the interrelationship between Man and Nature. This is the common thread in this series of events, problems and facts presented, although they are unrelated to each other. Therefore a

great variety of the readers' reactions is expected, the influence of one passage on the other being minimal.

The choice of the passages was influenced by the idea, that attitudes and values might change when they are no longer satisfying to the individual who holds them. Also it was assumed, that attitudes and values are components of a personality-structure, and that the relative ease of changing one or more of these components will be determined by their linkages with others. If for example a person believes that industrialization is essential for our existence, it will be extremely difficult to change this person's reverence to everything connected with industrialization, including changing landscapes destroying vegetation, etc. On the other hand, if one's attitudes about the desirability of nature conservation are not terribly strong and are unrelated to other important attitudes and values, this person will not be too disturbed by the construction of roads and quarries in a nature-reservation.

In order to introduce the topics included in the reading-passages, a short review is given to the reader here:

Passage 1: This passage is drawn from science-fiction. It is a description of an imaginary organism whose population grew recently in such an enormous way that biotic as well as physical components of this earth are in serious danger. In the final sentence of the passage it turns out, that it is our own human species which has been described.

Passage 2: This is a short allegory written by the Danish philosopher Kirkegaard, telling about a good-tempered farmer on the Isle of Zealand, who liked very much to observe the flight of migrating ducks. Unconscious of the possible outcome, he started supplying food to the ducks arriving near his farm. After two seasons or so, the ducks preferred to stay enjoying the ready food supplied to them. They became fatter and lazier and soon lost their ability to fly anymore.

Passage 3: In an ancient source the Greek traveller Herodotus is quoted, telling about a spring in the land of the Ammonians. The water of this spring was said to be hot at mid-night, but from sun-rise on, when it becomes hotter and hotter outside, the water cools down, until at noon it is really cool. 'And this is also the reason, why the Ammonians use the water of this spring for watering their gardens at noon'.

Passage 4: A team of medical officers of the British Navy landed on the Island of Tristan da Cunha in 1932. They reported, that 83 percent of the island's people had no teeth-deficiencies at all. Twenty three years later, the fourth survey of teeth-condition was carried out. This time only twelve percent of the islanders were found to have healthy teeth. The report ends with the following statements: It is possible to point out only two facts which might be relevant to teeth-condition: (1) In the thirties the islanders started to import tooth-brushes. (2) White sugar and white flour had been introduced during the last twenty years.

The last four passages will be described shortly:

No. 5: A short extract of Garrett Hardin's famous article: 'The Tragedy of the Commons'.

No. 6: A report on a public campaign against the flouridation of drinking water in one of the districts in England.

No. 7: An Israeli anecdote about an old man who still is sticking to his experience of riding on his donkey through the woods of the Sharon, which were cut down fifty years ago.

No. 8: A report about the Sembuga people of New Guinea, whose way of life is in an ideal equilibrium with their natural environment.

In several meetings with biology teachers and also with mixed groups of people, who regard themselves as environmentalists, two or three of the reading passages were presented at a time. In general the content of the material has been regarded as challenging. There was no difficulty to arouse a spontaneous reaction, followed by second and third reactions, which were more rational reasoning, mostly influenced by professional knowledge. Nevertheless,

there was a great variety of emphases , sometimes totally contradictory to each other, despite the fact that at the time only one topic had been discussed. After various opinions had been argued, an attempt was made to classify the views. The result is the following list of attitudes influencing people's approach towards environmental issues:

List of Attitudes towards the Environment

1. Conservatism
2. Innovation
3. Scepticism
4. Tendency to prejudice
5. Mercy
6. Risk taking
7. Criticism
8. Altruism
9. Egoism
10. "Love of Nature"
11. Flexibility
12. Innocence
13. Apathy
14. Ignorance
15. Laziness
16. Honesty
17. Curiosity
18. Awareness
19. Openmindedness
20. Irresponsibility
21. Conformism
22. Modesty.

The above list is a tentative list of items suggested by the participants in several discussions. Different passages were presented in each of the meetings, but in any case No. 2 (Kirkegaard's story) was included.

After constructing the list of attitudes, the discussion group went on trying to describe behaviours apparent in people's approach towards the environment. Very soon the conclusion was reached, that it is quite impossible to talk about 'desirable' or 'undesirable' attitudes in general and that a person's behaviour depends on a set of attitudes, the weight of each being different in different situations. One of the participants put it this way: "Isn't the whole idea of nature conservation a conservative trend, although we expect people to be innovative, open-minded and non-conforming in general"? Constructing a list of behaviours might help educators to reach a great awareness towards their students' approach concerning environmental issues.

People's reaction to Kirkegaard's story (No. 2) will be a good example of the contradictions inherent in environmental issues:

1. Innocence might yield unexpected damage.
2. The story is unrealistic. The migration of ducks depends on the action of hormones,which will not be changed during a short while of interference with natural conditions.
3. Ducks are like people: living in better conditions, they get lazy and less active.
4. Man's interference with nature might be irreversible. Sometimes most desirable things vanish because of unconscious actions.
5. Often animals are suffering because of plenty of mercy.

Despite the difficulties an attempt to construct a list of desirable and undesirable behaviours has been done.

List of Behaviours (no order implied)

1. Showing curiosity towards environmental events.
2. Making pessimistic comments on the future of mankind.
3. Being reluctant to accept pessimistic views.
4. Feeling helpless coping with environmental problems.
5. Believing, that it is possible to keep an honest way of life.
6. Not believing that things may change.
7. Admiring the beauty of nature.

8. Loving animals.
9. Showing mercy towards animals.
10. Trusting one's own senses.
11. Tending to evaluate things in an objective way.
12. Being prepared to abandon comfort and luxury in order to protect the quality of life.
13. Giving away pleasure in order to protect health.
14. Accepting willingly personal disadvantages in favour of others' benefit.
15. Being involved in public welfare.
16. Being prepared to lose money for the sake of environmental conservation.
17. Keeping a modest way of life.
18. Spending leisure time in the open country-side.
19. Being prepared to undergo certain experiences.
20. Being reluctant to accept innovations.
21. Showing courage.
22. Reluctant to make decisions.
23. Reaching decisions after thorough consideration.
24. Avoiding anxiety towards unexpected results.

Summary:

Traditional values concerning man's behaviour in nature, as well as the modern economic view upon nature and nature-resources are not always in accordance with the desired approach of confronting environmental problems today. Reluctance to acculturate attitudes and to transmit values in education is widesrpead, and is enforced by the idea of two roles of the human species: the 'biological' man and the 'cultural' man (5).

The above described activity might be regarded as an aid for educators to get to know better their own attitudes and values towards the environment, and also to become aware of the 'frame of mind' of their students. A list of attitudes, even being incomplete, might be helpful in deciding, what kind of attitudes and values should be emphasized in environmental education. In order to evaluate the outcomes of environmental education, a tentative list of behaviours presented above may help to follow possible changes of behaviour.

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IMPLICATIONS OF ENVIRONMENTAL EDUCATION IN EVERYDAY ACTIVITIES

by

Miriam Ben Peretz

The purpose of the workshop was to bring out ideas and to plan activities which demonstrate the responsibility of Man to maintaining and improving the quality of his environment.

The following problems were raised:

a) the gap between what is usually learned in schools and the everyday behaviour.

b) the doubts which accompany any educational attempt to deal with and develop values.

c) the difficulties involved in performing out of school activities.

The participants were divided into teams. Each team discussed certain issues and later reported to the whole group. A group discussion ended the activity.

AN EXPERIENCE IN ENVIRONMENTAL GAMES AND IN THE PROCESS OF GAME INVENTION

by
Gideon Carmi

The intention of the workshop was, to encourage teachers and curriculum planners to make use of games and of the process of game invention in school, in order to pass information and to create awareness to environment and ecology.

To that end, the following was carried out:

1. The participants played two games (1/2 hour each) - an outdoor game (direct contact with the environment) and an indoor (table) game (for conceptualization and for creation of self-insight into attitudes). The two games were specially created for the workshop* and they were intentionally not structured in a final way, so as to leave open ends for the next stage.
2. The participants discussed possible alternatives for the final structuring of the games. This way they gained active insight into the process of the design and the invention of a game.
3. The participants acquainted themselves with several environmental table-games which were invented and designed by pupils in Arad this year as part of their regular school-program. This way, the participants obtained an idea what one may expect of pupils (and were pleasantly surprised). More details:

(1), (2): A. The outdoor game is of the "field and nature" type. The participants split into 2 groups who get identical packs of task-cards and were sent to spread out over the portion of the H.U. Campus between the Meiser Building and the bus-station. Within 30 minutes they had to report about all unconceivable

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by Tamar and Gideon Carmi

environmental aspects of that area. The task cards covered a wide range of aspects, and left room for initiative, sense of humor and inventiveness. The group returned, noticeably sensitized to various environmental factors, quite involved in the subject and showed a strong urge to report and discuss their findings. This very involvement convinced them of the usefulness of such activities within the school curriculum. The discussion then turned to (quite interesting) suggestions for further developments of the game.

B. The indoors game is a table (board) game. The participants take a "trip" in a varied landscape on the board. The paths they choose are unstructured (each paves his own). They have to overcome environmental handicaps which opponents put in their way, by inventing on remembering reasonable solutions (e.g. the same type of pollution). At the same time they are engaged in "developing" the area in a pleasant way (building national parks, etc). The rules give plenty opportunity to amusing verbal interaction and inventiveness. One of the traits of the game is that competition is not the single motivation. A flexible and changing pattern of collaboration between two or more players is required without which one gets stuck (e.g., two have to collaborate to cross a river). This creates changing alliances, etantes and detantes and leaves room for more sophisticated interdependent strategies, as in real life.

Again, the game evoked discussions which, at first, focused on the environmental problems themselves and then on ideas for further development of the game.

(3) The participants acquainted themselves with three environmental games which were invented and developed by 3 pupils of the eleventh grade of the comprehensive school in Arad, under the direction of their teacher, Shaul Landau, within a sociology course (the other pupils in class also designed a game each). The participants were impressed by the high level and sophistication of inventiveness and execution and got to feel that this is indeed a good way to learn a subject and get involved. It requires quite some dedication and extra time of the teacher, though, as in other projects of individualized learning.

END TO HUNGER (A Simulation Game)

by
Avraham Blum

Simulation Games, Motivation and Learning

Simulation games penetrate more and more into the classroom. Their use is not longer restricted to the Social Studies and to culturally deprived children, who "anyhow cannot learn". The technique and the methodology of simulation games improved tremendously during the last decade. They are based upon a successful integration between the will to play which is in each child (and according to Nietzsche in every man) and the positive experiencemade with simulations in various teaching areas. Simulation turns out to be for social science what the lab is in the natural sciences.

While a review of many evaluation studies shows that simulation games do motivate, it remains doubtful if they are more effective than other methods in teaching facts or problem-solving skills, or in inducing critical thinking (Cherryholmes, 1966). Other researchers are more optimistic (Boocock and Schild, 1968). They believe that simulation games not only can generate great interest and involvement, but that the players also learn from their very participation in the game.

The Curriculum Unit "Fight Against Hunger"

Hunger has a direct effect on the quality of life of whole nations. Efforts are made to solve this problem which threatens the ever growing world population, in various ways. Because of the graveness of the hunger problem curricular materials have been prepared for students in 8th and 9th grade. Students learn basic concepts and different approaches to the problem by using task cards, which direct them to further reading, experiments and

discussions about controversial issues. Field experiments (done by those schools which have land facilities) serve to investigate some questions about plant improvement. Cole crops show how one botanical species, Brassica oleraceae, was selected and bred into different directions - for different purposes. The immense similarity of the seeds and even of the seedlings suggests a possible parallel between ontogenetic and phylogenetic development. Wild (resistant) tomatoes, planted next to a highly developed (but sucsepticle) cultivar demonstrate the changes induced in food plants during the ages. In another experiment students prepare a hybrid squash (using artificial pollinatior and compare its hybrid vigour with the performace of the parent strains.

The peak learning activity, which sums up the chapter on economic development and international cooperation, is the simulation game "End to Hunger".

The Place of the Simulation Game in the Fight Against Hunger Unit

A simulation game was deemed very appropriate for developing the student's consciousness of the world hunger problem as a major issue threatening the quality of life. There is no subject second to the fight against hunger, in which interest and involvement are so crucial. This is specially true for children of school age, who have little possibilities to do something to improve the state of affairs. The simulation game gives the student chance to "act" in a simulated situation, according to different motives, which are translated into interactions between him and his peers in the game. At the same time the game contains a factor of (controlled) competition, which enhances the involvement of the students and their willingness to succeed.

In the End of Hunger Game each student represents a rich or a developing country. Besides the efforts put into work, natural factors (draught, petrol etc.) and social factors (setting up an extension service, strikes, etc.) affect the prospects of the countries to procure food for their

ever growing populations. The vicious circle of hunger can be broken through the acquisition of knowledge and through economic development (which is represented in the game by a food machine, which multiplies the yields). Students discover that cooperation helps all of them and is necessary for progress.

In the workshops of the conference the participants played the End of Hunger game, and this was followed by short discussions on the potential uses of the game.

Summary of the Workshop Discussions

Workshop participants played 3–4 rounds in order to get to know the rules of the game and to experience its effects.

In the discussion, which followed the game, some suggestions were made. Many participants felt the involvement to be very strong and found that their economic situation (in the game) affected their mood still after the game was over. Therefore they expressed their view that the outcome of the game should be directed in such a way that almost all students should sum up with a positive result. (This can be done by lengthening the "growing season"). This view was stressed mainly by those participants which were not so lucky and successful in the game. The point was made that a positive end situation was specially important for deprived children, who had already enough frustrating experiences.

Another recurring remark concerned the value of the simulation game in giving the teacher a tool to observe his students' reaction in a play situation, which can be manipulated to a certain degree.

The experience accrued so far indicates that growing up children showed a higher standard of morality than adults (mostly teachers and university students) who had played the game. This was exposed, for example, in the greater concern of children, they might not be able to repay a loan or in their greater reluctance to pledge themselves politically against economic aid.

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PROJECT YERUCHAM - A SIMULATION GAME IN ENVIRONMENTAL EDUCATION

by

Moshe Shachak - Era Altman

Simulation game - Project Lake Yerucham is a model based on the problematics of setting up an artificial lake in the Negev. Its objective is to bring the players to an understanding of the difficulties involved in environmental planning.

In the game the players are of four types:
Industrialists - interested in the industrial development in the Negev and its resultant settlement.
Agrarians - require creation of "green areas" and rural settlement.
Recreation seekers - their goal is the creation of a national park that will be used as a recreation center in a nature setting.

Researchers, Educators and Preservationists - their intention is to preserve large areas in the desert for the needs of education and research.

These players are divided in their opinions as to how to use the Lake and its surroundings. The industrialists see it as a catch basin for effluents, the farmers as a water source, the recreation seekers as a recreation site, and the educators, researchers and preservationists as a preserve for research and study.

There are three turns in the game:
1. establishing the project,
2. development,
3. vigorous development.

In each turn the players will run into new problems, in particular:
a) how to plan a turn when the interests within the human group are opposed, and
b) how to develop an area and maintain the quality of life.

MAN AND NATURE: MAN AND NATURE

by

Shoshana Carmel

Man and Water is one of five topics designed by the Curriculum team at Haifa University. It represented a case study of one of the most important components of our environment - water.

The workshop was designed to familiarize the participants with the materials and activities designed for the students and the teachers. Teams of two to three participants dealt each with an exemplary activity for about an hour. Then each team reported to the entire group on its activity. In this manner a complete picture of the program was obtained, as well as an example of the way teachers consider various aspects of it.

ANALYSIS OF STUDENTS' WORK - MAN AND WATER

by

Helena Karmon

This workshop gives the participants the possibility to acquaint themselves with the subject by studying the childrens' projects individually, or in groups.

The items for this workshop are displayed in "stations".

- Students' books with reports, essays, summaries and newspaper cuttings.
- Poster with cuttings and graphs summarizing a series of experiments (Oxygen, pH and turbidity tests). A poster summarizing a field trip to a river - map and graphs of water tests.
- Colour slides, showing students working in the lab and in the field, testing water samples.
- Audi-tape - a discussion (suggestions and criticism) with the students about the program at the conclusion of the course.

The participants in the workshop received a list (appendix 1) of the objectives as they have been defined by the "Man and Water" writing team, and (app. 2) a table with the "stations" and the objectives. After studying the items in the various "stations" one can evaluate to what extent the objectives were achieved.

The group discussion enables the participants a critical examination of the projects and may contribute in improving the teaching of this subject.

Appendix 1

Man and Water - What are the Objectives?

1. To recognize environmental factors influencing Man and man's influence on his environment.
2. To create an awareness of the far reaching impact man has on his environment.
3. Participation and experience in carrying out surveys, quantitive and qualitive experiments dealing with this subject.
4. To stimulate the pupils' personal involvement in the subject "The Quality of the Environment".
5. Providing the means where by pupils could protect and improve the quality of their environment.

A few additional general aims that are not specific to this program:

6. The ability to use previous knowledge and experience.
7. To practice using materials and instruments, carrying out experiments and making exact observations.
8. The capability to sort out collected data and information.
9. The ability to plan an experiment or instrument to solve a practical problem.
10. The ability to analyze and evaluate information.
11. The ability ot use previous knowledge in new situations and to demonstrate creative thinking.

Appendix 2

Man and Water - Analysis of Students' projects

"Station topic and no." / objective No.	Written Works		News Cuttings	Practical Work					Class Summaries		Notes
				O_2 tests	pH and turbidity	Algae	test in the field	Aquarium tests	Field trip	Discussion of results	
	books	books	poster	slides	slides	slides	slides	slides	poster	slides	
	A	B	C	D	E	F	G	H	I	J	
1											
↓											
11											

a) Read the related objective list.

b) Go through the material in every "station".

c) After examining every "station" mark "+" or "-" in the right place, according to the following key:

- if in your opinion this kind of work is suitable to obtain the objective, or if the objective has been achieved - mark "+".
- if in your opinion this form of work is only partly suitable, or only partly fulfilled the objective - mark "+ -"
- if in your opinion this work is <u>not</u> suitable, or the objective was not achieved, mark "-".

INQUIRY ACTIVITIES DEALING WITH THE ENVIRONMENT

by

Patricia Sparks

Environmental education requires a new approach to problem solving.

The workshop is based on an inquiry approach by involving the participants in actual investigations as follows:

a) an investigation of the school yard
b) an investigation of a parking lot
c) testing an area which suffered of soil erosion
d) where is the garbage trail?

These activities are intended to promote the following skills: observation, comparison, classification, drawing conclusions, prediction, posing questions, planning and executing experiments, data collection, data analysis and data evaluation.

MAN'S INFLUENCE ON ENVIRONMENTAL QUALITY

by

Leah Shaham

The purpose of the film "Environment", which was produced in the United States by Bernard Wiletts B.F.A. is to produce a high degree of involvement among its viewers in problems of improvement of environmental quality whether they be upper classmen or teachers. Even though the movie is an American production, it clearly shows that the problems of environmental improvement are universal, and that there is no country in which the confrontation between environmental quality and increases in the standard of living does not exist.

Before viewing the movie, the students (viewers) work in groups (20 minutes). Their task is to make a list of environmental problems (1-6) which we have to face when we are about to develop a new residential area. This activity will introduce the group to the topic which serves as the focus of the film.

The movie is presented like a trial in which the prosecutor prosecutes humanity, which is represented by 4 people, for the damange it causes to the quality of life and we, the viewers are expected to serve as jury.

I would like to describe some of the reactions which occured during the workshop.

In the movie thereare situations which represent the problems of environmental pollution at their worst. Some of the viewers at the workshop strongly objected to the way in which the problem is presented, while others saw it as a strong motivation towards involvement, debate, and identifying problems.

After my own experience leading three workshops, I learned that the discussion should be turned directly to the issues raised in the movie.

For example (a) the farmer who loves his soil, whose family has lived in the Eagle River Valley for 100 years, is proud of his crops, but pollutes the soil and the ground water with nitrogenous fertilizers and insecticides. Do we have this problem too? Does the farmer have to change his values, his approach? What are his alternatives?

(b) Or what will you answer to the housewives' question: What do I do? Do I stop using canned food, and wraps, and do I stop bearing children"?

The problems of the land developer and the industrialist who distribute energy for industrial development should be dealt with in a similar manner.

While watching the behaviour of the blackman it seems that the problems of environmental preservation and ecology are exaggerated. Do we have a similar problem, and where? Why do we have such a feeling?

In conclusion, the discussion should focus on the following: How do we preserve environmental quality so that it will be pleasant to live hand in hand with population growth and an increasing standard of living, which means establishment of industries, development or transportation and all that is involved in it. Are there only technological solutions here? Or are there fundamental values here? Since the problem is, what kind of life do we want to lead, interdisciplinary cooperation in environmental planning and value is a must.

Although the movie is sometimes irritating and objections may arise about the format, nobody remains indifferent to the problems of environmental quality and that is its great virtue.

LIGHT AND DARKNESS - CANDLES AND TRANSPORTATION

by

N. Ben-Zvi and S. Novick

Introduction

Science educators at all levels will agree that learning experiences should, when possible, emphasize environmental involvement. Yet in science lessons we normally aim at acquiring knowledge and developing concepts. Can these lessons simultaneously foster values and attitudes about environmental quality? Such a combination if not forced should contribute both to the aims of environmental education and to learner motivation.

Participants in the workshop explored a number of suggestions for dealing with a typical environmental problem (air pollution) through various kinds of involvement.

The Workshop in Action

a. An attitude survey

Since participants were to work in groups for about two hours, they first considered the question, what attitudes are held initially. This was done by presenting six extreme statements, positive and negative, about the quality of life and the environment. Participants' responses formed the basis for dividing them into small working groups so that each group contained people who differed considerably in their attitudes. It was readily apparent that this technique could be applied with pupils about to begin a lesson related to environmental quality. Heterogeneity in the groups can contribute to lively debate and enhance a sense of involvement.

b. Investigating Candles

Several modern chemistry programs have used activities with a burning

candle as an effective introduction. Our workshop activity also began with candle activities. Before looking at the candles, participants were asked to list all the chemical and physical concepts that can be associated with an ordinary burning candle. It turns out that the list is surprisingly long - as can also be seen from Faraday's Christmas lectures on the candle, over a century ago.

Working groups were then given a number of small hollow wick candles, some chemicals and simple laboratory apparatus (test-tubes, flasks, droppers, etc). Some of these candles made from materials which give off much soot and other pollutants (sulfur dioxide). After investigating those candles, their value in introducing air pollution topics was apparent. This realization led the group into the next activity.

c. A Film on Air Pollution

A film presenting typical urban air pollution effects in a neutral way opened a discussion of how to use it in an educational setting and what activities would be appropriate before and after such a film presentation.

d. Data Sheeets for Class Discussions

Two data sheets were considered: (1) sources of air pollutants in Israel, (2) relative contribution of different transportation modes to air pollution.

The first exercise was based on a series of circle graphs appearing in a recent report on air pollution by the Environmental Protection Agency. The total area of each circle is proportional to the total weight of a given pollutant. Participants were presented with these circle graphs and asked to prepare discussion question centering on the data presented in the graphs. From this exercise it becomes apparent that transportation is a major contributor to air pollution. The next exercise was presented as one approach to the transportation problem.

A data table listing the relative emission of various pollutants per passenger mile by different transportation modes was distributed. Again participants suggested discussion questions based on the data presented.

e. Summary

Several methods for stimulating interest and discussion of air pollution emerged during the workshop. It was emphasized that these activities could be integrated into any chemistry course. The workshop concluded with a brief overview of an Israeli environment-oriented chemistry program for non-science majors, "Chemistry in Modern Society".

THE FLY, DDT AND US

by

Benjamin Feinstein

The Problem of Accumulating Insecticides Residues

Pollution of food with residues from insecticides and their accumulation in our bodies are two of the ecological problems which should concern us. This is especially true in Israel, where large quantitites of non-biodegradable insecticides are used, control is negligible and the concentration in the body fat is among the highest in the world. The problem should not be solved by a general prohibition of chemical insecticides - an action that would bring death to millions of people as a result of diseases transmitted by insects and as a result of the damage caused to crops by other insects. Therefore it is better to seek a more balanaced solution based on the present situation in science and technological progress. In order to decide upon the optimal solution, an understanding of the problem of exterminating harmful insects is required. The study unit "The fly, DDT and Us", which was adopted in the Ministry of Education and Culture Curriculum Center, and which appeared in the Ma'alot Edition, deals with this.

The Mediterannean fruit fly was chosen as a central object in the unit because it is one of the most dangerous pests to many types of fruit in Israel and many other countries. The student also learns about different insects, both harmful and beneficial to man, about their life cycle and their mutual relations. The students grow Mediterannean fruit flies and follow their development and the damage they cause to oranges.

At this stage "The Rise and Fall of DDT" is presented to the student, the story of its discovery, the initial enthusiasm over it in wartime and in time of peace,but also the disappointment following

the breach of the biological balance. DDT kills the Mediterannean fruit fly, but it's broad range of activity is also dangerous to the fly's natural enemies, to beneficial insects and other animals whose place in the biological balance until now remained unshaken. In a simple laboratory exercise, the students examine how DDT affects the fruit fly and one of its natural enemies (a parasitic wasp brought from Hawaii), a house fly, the honey bee, and minnows in an aquarium. They discover that these animals are killed with one surprising exception: the housefly which developed resistance to DDT. Hence, they see the need for a more efficient solution to the fruit fly problem. A portion of these experiments were demonstrated in the workshop.

The way in which natural enemies of the Mediterannean fruit fly lay eggs into the pupa of the host and the way in which parasitic fungi attack larvae of the farodenia is examined in other experiments which were demonstrated.

THE QUALITY OF WATER

by

Neti Buras

Actual tests and discussion of their implications were performed on the quality of water.

Criteria for determining the quality of water were presented. The discussion focused on the quality of water as an indicator of the impact of Man on his Environment and the role of water in disease dissemination.

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